



George C. Marshall Space Flight Center
Marshall Space Flight Center, Alabama 35812

HOSC-PLAN-661
Revision H
10 November 2003

Flight Projects Directorate
Ground Systems Department
FD 40

QUALITY PLAN FOR THE
HUNTSVILLE OPERATIONS SUPPORT
CENTER (HOSC) PROJECT

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Flight Projects Directorate / Ground Systems Department FD40		
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DOCUMENT HISTORY LOG

Status (Baseline/ Revision/ Canceled)	Document Revision	Effective Date	Description
Baseline		Mar. 14, 2001	
Revision	A	Apr. 24, 2001	Section 1.3 Applicability reworded. Section 5.1.2 last sentence deleted. Exhibit 5.1.2.1-1 item 4.3 changed to "Customer Agreement Review." Section 5.6.2 credit card orders added. Quality Record sentence added. Section 5.14.1 added "How Are We Doing Survey"
Revision	B	Aug. 10, 2001	Replaced reference from MM 4000 to MWI 4520.1. Removed references to FPD-OI-FD40.1 and FPD-OI-FD40.6 through document. Revised Section 2 References. Revised Section 3 Definitions/Acronyms. Replaced Exhibit 5.1.2-1 (removed Chandra). 5.2.3 revised to include 3 new PIP definitions (bullets). Replaced Exhibit 5.2.3-1. 5.4.5 added sentence re: output review. 5.6.2 added QR to Purchasing documents. 5.9.3 Facility procedures reference. 5.10.1 added acceptance criteria. 5.10.4 replace reference of FPD-OI-FD40.1 to FPD-OI-FD40.4 and replaced the following 2 bullets. 5.10.5 added acceptance criteria. 5.11 removed fabrication shop. 5.13 added reference to problem reports as QR. 5.17 revised 2 nd sentence. 5.17.4 revised section. 5.19.3 added reference to ASRS ... SRS ... 5.20 revised section.
Revision	C	Oct. 5, 2001	Revised sections throughout to implement ISO 9001:2000 revision.
Revision	D	Nov. 20, 2001	Incorporate changes for PPS contractor support
Revision	E	May 23, 2002	7.1.1.3 update objective and goals flowdown. Appendix A remove HOSC-PLAN-119. Appendix B update PIPs to remove reference to Annual Process Review Notes – this is handled through the continuous improvement/process monitoring records. Appendix C remove reference to Annual Process Review Notes; clarify alignment with PIPs. Appendix D added to include current year flowdown of NASA/MSFC/FPD objectives and goals.
Revision	F	Oct. 14, 2002	Section 7.1.1.4 and elsewhere – change Management Review Group (MRG) to Management Review Board (MRB). Section 7.1.3.2, 7.1.5.2, 7.5.3, 7.6.1, 7.7.1, 7.8.1.2, 7.8.1.5, 7.8.1.6, and 7.8.1.9 – add requirements for ISO 9000-3/software compliance. Section 7.8.3.6 – update monitoring and measurement of process.
Revision	G	Jun. 9, 2003	Removed requirements for Payload Data Library. Updated Section 7.8.8 to reflect MSFC revised guidance on linking safety and fee.

CHECK THE MASTER LIST - VERIFY THAT THIS IS THE CORRECT VERSION BEFORE USE

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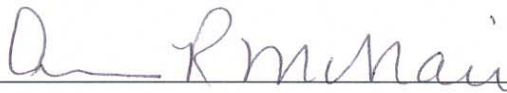
Status (Baseline/ Revision/ Canceled)	Document Revision	Effective Date	Description
			CWC retention code changed from 3 to 5. Corrected MWI 8715.15 title.
Revision	H	Nov. 10, 2003	<p>Added requirements of SAE AS9100A synopsized as follows:</p> <ul style="list-style-type: none"> • Awareness of, access to, and use of procedures (Section 7.1.2) • Control of Production and Service Provision details (Section 7.1.5.2) • Applicability of continuous improvement procedures to contractors/suppliers (Section 7.1.6) • Applicability of records control procedures to contractors/suppliers (Section 7.1.7) • Training/Awareness details (7.3.1) • Procurement/Purchasing details (Section 7.5) • Design and Development Output details (Section 7.8.1.5) • Product release approval authority (Section 7.8.1.7) • Control of Monitoring and Measuring Devices details (Section 7.8.4) • Release authority and safety/mission success-related aspects of nonconforming products (Section 7.8.6) • Integrated the ALERTs process in <ul style="list-style-type: none"> – Preventive Action (7.1.6.3) – Design and Development Inputs (7.8.1.4) – Control of Nonconforming Product (7.8.6) – System Safety Tools (7.8.8.1.1) • Removed references to process documents now covered within the Configuration Management Plan <ul style="list-style-type: none"> – FPD-OI-FD40.6, Ground Systems Design and Development – FPD-OI-FD40.1, Macro Flow

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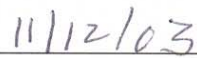
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Approved by:



Ann McNair

Huntsville Operations Support Center Project Manager



Date

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1. PURPOSE

The purposes of this Quality Plan are:

- To ensure the high quality of all HOSC Project products and services,
- To promote system and industrial safety,
- To define the Ground Systems Department (GSD)/Huntsville Operations Support Center (HOSC) Project approach to implementing the requirements of MPD 1280.1, Marshall Management Manual (MMM) and FPD-OI-FD01.1, Management Process, and
- To provide a documented mechanism to tie specific requirements of the HOSC Project and customer requirements to MPD 1280.1 and sub-tier procedures.

2. APPLICABILITY AND SCOPE

The guidance of this plan is applicable to all related activities of the GSD/HOSC Project. This guidance is specifically applicable to the activities of the civil service personnel. It is applicable to support contractor personnel in instances wherein they directly support the procedures defined herein.

This guidance is effective as of 15 March 2001. Reverse engineering of records covering activities which precede the implementation date is not required.

The scope of this plan includes, but is not limited to:

- The MSFC, Flight Projects Directorate (FPD), GSD/HOSC Project,
- The products and services described in the HOSC Project Plan, and
- The project objectives as described herein.

The GSD/HOSC Project includes the full scope of activities covered by the ISO 9001 requirements. The Project provides life cycle support of facilities, data processing and communications resources for multiple programs managed by NASA. This support relates to spacecraft control, payload operations engineering and propulsion systems engineering support. This support includes *development* of the data processing and communications systems, and mission support systems. Thus, these systems constitute the organization's principal "products" as defined in ISO 9001. This support also includes *operating* the systems/products for extended periods of time as well as providing on-going sustaining engineering for the developed systems. This latter support is primarily considered in Section 7.1.9 Servicing.

The contents and structure of this plan are based on MPD 1280.1, Marshall Management Manual to ease use and correlation of alignment among paragraphs/sections. Note, appearance of the symbol on the right in the margin indicates an ISO 9001-required Record.

R

3. AUTHORITY, REVIEW, ACCEPTANCE, AND REVISION

The authority for this plan is MPD 1280.1.

Review and approval of this plan and any revisions to it are within the process required in the project configuration management plan and/or customer agreement requirements as per MWI 7120.1, Project Quality Plan, Paragraph 6.2.4. Minimum approval requirements are the Project Manager and, as applicable, the customer as defined by customer agreement. This includes the establishment of objectives and goals. All parties affected by this plan are part of an informal review initiated by the Management Representative (MR) so as to alleviate downstream changes, schedule delays, delegation problems, and record problems.

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4. APPLICABLE DOCUMENTS

FPD-OI-FD01.1	Management Process
FPD-OI-FD40.4	Flight Certification for Ground Systems
FPD-OI-FD40.7	Remote Servicing Plan
FPD-OI-FD40.10	HOSC Problem Report
FPD-OI-FD40.12	Task Directives
FPD-OI-FD40.13	Utilization and Mission Support (UMS) Contractor Performance Evaluation
FPD-OI-FD43.1	Ground Systems Operations
FPD-OI-FD43.2	HOSC Configuration Request
HOSC-HDBK-003	HOSC Facilities Document
UMS-HOCD-004	HOSC Operations Configuration Document
HOSC-HUH-233	HOSC User Handbook
HOSC-PLAN-009	HOSC Contingency Plan
HOSC-PLAN-209	IST Training Plan
HOSC-PLAN-623	Huntsville Operations Support Center Project Plan
HOSC-PLAN-635	HOSC Project Risk Management Plan
HOSC-PROC-180	HOSC Standard Operating Procedures
HOSC-PROC-187	Internal Operating Procedures
HOSC-SYS-085	HOSC Development Configuration Management Procedures Manual
HOSC-SYS-121	HOSC Validation and Certification Plan
JSC-27379	Support Requirements System Management Plan
KSC HB GP60-3	Automated Support Requirements System (ASRS) Handbook
MPD 1200.3	Power and Authority directive for MSFC Operations
MPD 1280.1	Marshall Management Manual
MPD 2210.1	Documentation Input and Output of the MSFC Documentation Repository
MPD 3000.1	MSFC Flexiplace Program
MPG 1050.1	Contract (Customer Agreement) Review
MPG 1230.1	Center Resources Management Process
MPG 1280.1	Management Review
MPG 1280.2	Process Control
MPG 1280.4	MSFC Corrective Action System
MPG 1280.6	Internal Quality Audits
MPG 1280.7	Servicing
MPG 1280.8	Customer Satisfaction
MPG 1280.9	Continual Improvement
MPG 1371.1	Procedures and Guidelines for Processing Foreign Visitor Requests

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MPG 1440.2	MSFC Records Management Program
MPG 1600.1	MSFC Security Procedures and Guidelines
MPG 1800.1	MSFC Smoking Policy
MPG 2190.1	MSFC Export Control Program
MPG 2220.1	Scientific and Technical Publications
MPD 2810.1	Security of Information Technology
MPG 2810.1	Security of Information Technology
MPD 2810.2	Cleaning Information from Computer Equipment at MSFC
MPG 3300.1	Dual Career Path Promotion Process
MPG 3410.1	Training
MPG 3600.1	Attendance and Leave
MPG 3600.2	Time And Attendance Process
MPG 4000.1	Control of Customer-Supplied Product
MPG 5000.1	Purchasing
MPG 6410.1	Handling, Storage, Packaging, Preservation, and Delivery
MPG 7120.3	Data Management, Programs/Projects
MPG 8040.1	Configuration Management, MSFC Programs/Projects
MPG 8040.2	Product Identification
MPG 8060.1	Flight Systems Design/Development Control
MPG 8060.2	Non-Flight and Non-Facility Design and Development
MPG 8715.1	Marshall Safety, Health, and Environmental (SHE) Program
MPG 8730.4	Statistical Techniques
MPG 8730.5	Control of Inspection, Measuring, and Test Equipment
MPG 9710.1	Travel Process
MSFC-HDBK-3173	Project Management and System Engineering Handbook
MSFC-PLAN-904	HOSC Functional Requirements and Implementation Plan
MSFC-PLAN-2929	Configuration Management Plan for the Huntsville Operations Support Center (HOSC)
MSFC-PLAN-2934	HOSC Emergency and Disaster Recovery Plan
MSFC-PLAN-3046	Data Management Plan for the Huntsville Operations Support Center (HOSC)
MSFC-PROC-1933	HOSC Access Procedures
MSFC-RQMT-1440	Generic Requirements for the Enhanced HOSC System
MSFC-RQMT-2467	HOSC ITS Requirements
MSFC-RQMT-2629	TReK Requirements Document
MWI 1280.5	MSFC ALERT Processing
MWI 1382.1	Protection of Privacy Act Information at MSFC
MWI 4520.1	Receiving

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MWI 5100.1	Procurement Initiator's Guide
MWI 5113.1	Governmentwide Commercial Purchase Card Operating Procedures
MWI 5116.1	Evaluation of Contractor Performance Under Contracts with Award Fee Provisions
MWI 1520.1	Visual Aid, Graphic, and Publication Production Services
MWI 7120.1	Project Quality Plan
MWI 7120.4	Documentation Preparation, Programs/Projects
MWI 7120.5	Data Management Plans, Program/Projects
MWI 8040.4	Application Guidance for Traceability
MWI 8621.1	Close Call and Mishap Reporting and Investigation Program
MWI 8715.15	MSFC Safety Assessment Program
NPD 1280.1	NASA Management system Policy
NPD 8621.1	NASA Policy for Limiting Orbital Debris Generation
NPD 9710.1	Delegation of Authority to Authorize or Approve Temporary Duty (TDY) Travel
NPG 1450.10	NASA Correspondence Management Communications Standards and Style
NPG 3600.1	Attendance and Leave
NPG 8715.3	NASA Safety Manual
NP-2002-03-54-MSFC	MSFC Implementation Plan

5. REFERENCES

- a) ANSI/ISO/ASQ Q9001-2000, American National Standard, Quality management systems – Requirements
- b) ANSI/ISO/ASQ Q9000-2000, American National Standard, Quality management systems – Fundamentals and vocabulary
- c) ISO 9000-3, Quality management and quality assurance standards – Part 3: Guidelines for the application of ISO 9001 to the development, supply and maintenance of software.
- d) Society of Automotive Engineers (SAE) AS9100A, Quality System – Aerospace – Model for Quality Assurance in Design, Development, Production, Installation, and Servicing

6. DEFINITIONS/ACRONYMS

ALERT. Acute Launch Emergency Restraint Tip.

Build or Release. A logical integration of functional configuration items, characterized by a version number.

CWC. Collaborative Work Commitment.

CCB. Configuration Control Board.

Characteristic. Distinguishing feature.

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Configuration Item. A logical integration of functional units or components (software, hardware, etc. modules), characterized by a version number.

Configuration Management (CM) Plan. The document that describes the manner in which requirements for configuration management will be implemented for the HOSC Project.

Contractor. A commercial organization that provides a product or service to the HOSC Project in a contractual situation. (Synonymous with "subcontractor" in the ISO standard.)

Customer Agreement (CA). The signed agreement between MSFC/HOSC Project and its Customer(s) which establishes the parent requirements for the product or service and the necessary resources. Only the Supplier's (GSD/HOSC Project Manager) signature establishes that the Supplier has agreed to the requirements. A CA documents a set of promises which requires a commitment of MSFC/HOSC Project resources (e.g., personnel labor and expertise, information, or use of equipment and facilities) to accomplish the objectives of the CA.

Customer/Purchaser. The recipient of a product or service provided by the HOSC Project. A customer may be internal to MSFC or external.

Data. Any electronic or written information/statement which represents policies, procedures, instructions, instructional material, drawings, plans, specifications, requirements, handbooks, manuals, reports, standards, or other correspondence. These may be stored in a variety of media such as magnetic tapes, computer disks, data sheets, log books, strip charts, photographs, videocassettes, etc.

Data Management. The timely and economical identification/definition, preparation, control, and disposition of documents, records and data required by the HOSC Project.

Data Management (DM) Plan. The document that describes the manner in which requirements for data management will be implemented for the HOSC Project (i.e., MSFC-PLAN-3046).

Data Product. Any space vehicle/payload-related technical data provided by the HOSC Project to its customers. These may be engineering/scientific measurements, voice or video delivered via networks, magnetic tapes, computer disks, etc.

Design Input. Customer functional, special, statutory, and/or regulatory requirements that the product must meet.

Design Output. Result of the design process such as design drawings, specifications, sketches, instructions, etc.

Design Process. An organized effort by technically trained personnel to create a design output that will produce a defined result within a specified budget to a predetermined schedule.

ECR. Engineering Change Request.

Flight Hardware, Flight Software, and Ground Support Equipment. Within the scope of MSFC ANSI/ASQC Q9001 registration, flight hardware, flight software, and flight or ground support equipment will be considered any hardware or software that is intended to fly in, or is part of, the Space Transportation System (STS) or some other flight system. Hardware and software intended to fly only on a balloon flight, sounding rocket, or aircraft flight are excluded.

FPD. Flight Projects Directorate.

FRR. Flight Readiness Review.

GSD. Ground Systems Department.

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Ground Support Equipment (GSE). Non-flight systems, equipment, or devices (with a physical or functional interface with flight hardware) necessary to routinely support the operations of transporting, receiving, handling, assembling, inspecting, testing, checkout, servicing and launch of space vehicles and payloads at launch, landing, or retrieval sites.

HOCG. HOSC Operations Control Group.

HOSC. Huntsville Operations Support Center.

HMCG. HOSC Management Coordination Group.

HPR. HOSC Problem Report.

HSPPD. Handling, Storage, Packaging, Preservation, and Delivery.

HVCP. HOSC Validation and Certification Plan.

I&T. Inspection and Test.

ITA. Intercenter Task Agreement.

IST. Integrated Support Team.

MLR. Management Lead Representative.

MMS. MSFC Management System.

Management Representative (MR). The individual directly assigned by the GSD/HOSC Project to document, direct and/or perform the project specific quality assurance functions.

MRB. Management Review Board.

Marshall Policy Directive (MPD). A directive issued to state policy, formal delegations of authority, identify responsibilities, and principal policy relationships. Exceptional (in format and content) MPD's: Marshall formal delegations of authority are specified in MPD 1200.3C; Marshall's Quality Management policy is specified in the Marshall Management Manual, or MMM, (MPD 1280.1). These directives are approved/signed by the Center Director.

Marshall Procedures and Guidelines (MPG). A Center-level inter-organizational directive that documents procedural requirements for how Center-level activities are conducted to implement NASA and/or MSFC policy. The MPG directives are approved/signed by the Directorate level or higher. MPG's are procedures containing mandatory requirements; guidelines are used for reference only and must be clearly noted to prevent confusions with requirements.

Marshall Work Instruction (MWI). A directive that provides detailed instructions on performing specific duties that apply to all or numerous MSFC organizations. The MWI directives are approved/signed by the Directorate level or higher.

MSFC. Marshall Space Flight Center.

MSOG. Mission Systems Operations Group.

NCR. Nonconformance Report.

NEMS. NASA Equipment Management System.

NQA. National Quality Assurance.

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O&M. Operations and Maintenance.

Organization. Group of people and facilities with an arrangement of responsibilities, authorities and relationships.

OWI/OI. Organizational Work Instruction.

PPS. Payload Planning System.

Process. Set of interrelated resources and activities which transform inputs into outputs. Resources may include personnel, finance, facilities, equipment, techniques, and methods.

Product. The end result of activities or processes which is delivered to the customer. These include software, hardware, documentation and data products.

Product Implementation Plan (PIP). A document that establishes the baseline for activity implementation for a significant/major HOSC Project development or operations activity. It includes descriptions of internal agreements concluded with the authority of the HOSC Project Manager. (External agreements are flowed through the HOSC Project Plan.) The PIP defines the procedures to be used to satisfy all applicable elements of this Quality Plan, including any deviation from the HOSC standard procedures cited in this Quality Plan. The PIP is subject to the approval of the Group Lead and the Project Manager.

Program. An activity within an Enterprise having defined goals, objectives, requirements and funding and consisting of one or more projects, reporting to the NASA Program Management Council (PMC), unless formally delegated to a Governing PMC.

Project. A significant activity designated by a program and characterized as having defined goals, objectives, requirements, life-cycle costs, a beginning, and an end. Within this plan, "HOSC Project" refers to the GSD/HOSC Project, as defined in HOSC-PLAN-623, HOSC Project Plan. Major development activities within the HOSC Project are referred to as (lower case) "projects." These are defined in project plan or product implementation plans.

Program/Project Data. All data required for the definition of the product and the management of the Program/Project.

Program Plan. The document that establishes the overall baseline for program implementation as well as the internal and external agreements concluded with the authority of and/or among the Administrator, the Enterprise Associate Administrator (EAA), Lead Center Director (LCD), other NASA Center Directors, and the Program Manager.

Project Plan. The document that establishes the overall baseline for project or activity implementation as well as the internal and external agreements concluded with the authority of and/or among the LCD, Program Manager, Project Manager, and other involved NASA Center managers/directors (i.e., HOSC-PLAN-623).

POP. Project Operating Plan.

PSLA. Project Service Level Agreement.

Quality. Degree to which a set of inherent characteristics fulfills requirements.

Quality Objective. Something sought, or aimed for, related to quality. Quality objectives are generally based on the quality policy and should be measurable.

Quality Plan. The document that establishes the specific quality practices, resources, and sequence of activities relevant to a particular product, project, or activity (i.e., the HOSC Project).

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Quality Policy. Overall intentions and direction of an organization with regard to quality, as formally expressed by top management.

Quality System. Organizational structure, procedures, processes, and resources needed to implement quality management.

RRB. Risk Review Board.

SAE. Society of Automotive Engineers.

S&MA. Safety and Mission Assurance.

Service. The results generated by activities at the interface between the supplier and the customer and by supplier internal activities to meet customer needs.

SCDS. Space Communications and Data Systems.

Supplier. An organization that provides a product/service to the GSD/HOSC. A supplier can be internal or external. In a contractual situation, a supplier is called a “contractor.”

TReK. Telescience Resource Kit.

Unit or component. A functional software, hardware, etc. module, characterized by a version number.

Validation. (Per MPG 8060.2) - Confirmation by examination and provision of objective evidence that particular requirements for a specific use of a product are fulfilled.

Verification. (Per MPG 8060.2) Confirmation by examination and provision of objective evidence that specified requirements of design activity output has been fulfilled.

7. POLICY

7.1 Organization and Administration

The Project has established and maintains documented procedures/instructions for safety, quality, general management, and administrative processes and continually improves their effectiveness.

7.1.1 Management Responsibility

7.1.1.1 Management Commitment

GSD Project Management is committed to the development and implementation of the MMS and the GSD safety/quality system and continually improving their effectiveness by:

- a) Communicating to the organization the importance of meeting customer as well as statutory and regulatory requirements
- b) Establishing the policy
- c) Ensuring that objectives are established and realized
- d) Ensuring the availability of resources.

Project management ensures that the integrity of this plan is maintained when changes are planned and implemented, and that it supports the MMS.

Project management ensures that appropriate communication processes are established within the Project and that communication takes place regarding the effectiveness of the safety/quality system.

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7.1.1.2 Policy

Quality Policy
<p>HOSC Project policy is:</p> <ul style="list-style-type: none"> to provide quality products and services to our customers, and to comply with requirements and continually improve the effectiveness of the safety and quality management system.

Each Manager and Lead is responsible for ensuring the policy is understood, implemented, and maintained at all levels of the organization.

The policy is communicated throughout the organization via orientation, employee training, and reviews with management. It is reviewed via the Management Review Board (MRB) and continuous improvement processes (Sections 7.1.1.5 and 7.1.6) for on-going suitability.

7.1.1.3 Goals, Objectives, and Principles

NASA's achievement of its objectives and goals relies on each of the Field Centers achieving their respective component objectives and goals. Likewise, MSFC's achievement of its objectives and goals relies on each MSFC organization achieving their respective component objectives and goals. Thus, the GSD/HOSC Project has defined its safety/quality objectives and goals to align with those of MSFC, #1 to ensure focus on Center level guidance and #2 to ensure clear traceability of GSD metrics to MSFC metrics. In addition, the GSD has aligned its values with the MSFC Values, since these clearly project a mindset toward achieving the objectives and goals. This flow/alignment and the GSD objectives, values, metrics and goals are defined in Exhibit 7.1.1.3-1.

MSFC, FPD and GSD		GSD Metric (records)	GSD Goal
Objective	Value		
Create a Safe and Healthy Environment	People	Mishaps	0
Satisfy our customers with our products and services	Customers	Problems/defects (HPR)	0
		User survey rating	4+
		"How are we doing" survey rating	Good+
Provide a continuously learning workforce	Excellence	Training/Events/Participation Planned and Executed	Conducted per Plan
Improve corrective action response time	Teamwork	Continuous Improvement suggestion time to closure	Decreasing
Detect nonconformances and take corrective action		GSD/Internal Nonconformance Reports	0
Continually improve our processes	Innovation	MSFC/NQA Nonconformance Reports	0
		GSD Continuous Improvements	As needed to achieve the other Goals

Exhibit 7.1.1.3-1. MSFC to GSD Objectives Flowdown

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Continuous focus on achieving these goals will ensure the health and continuous improvement of the safety/quality system.

The flowdown of specific, current year, NASA goals, objectives and performance targets and the GSD's supporting activities are provided in Appendix D. This flowdown is defined from the MSFC FY 2002 Implementation Plan and the MSFC Balanced Scorecard System.

The GSD Quality Principles are:

- We honor our commitments.
- We value our customers and treat them with respect.
- We strive to create and maintain high quality products, processes, and services.
- We strive to provide clear definition of products, processes, and services.
- We strive to understand our environment and our customer's needs.
- We create and maintain customer support services.
- We are responsive to customer feedback.
- We have well-trained, knowledgeable people.
- We focus on building and maintaining competence, honesty, and integrity.
- We seek new ways to infuse new technology into our products.

7.1.1.4 Organization

The Project organization is shown in Exhibit 7.1.1.4-1. Civil service personnel are responsible for the quality of all Project products and services. This includes products and services developed and provided directly by the civil service personnel as well as those products and services which the Project procures through contracts with industry.

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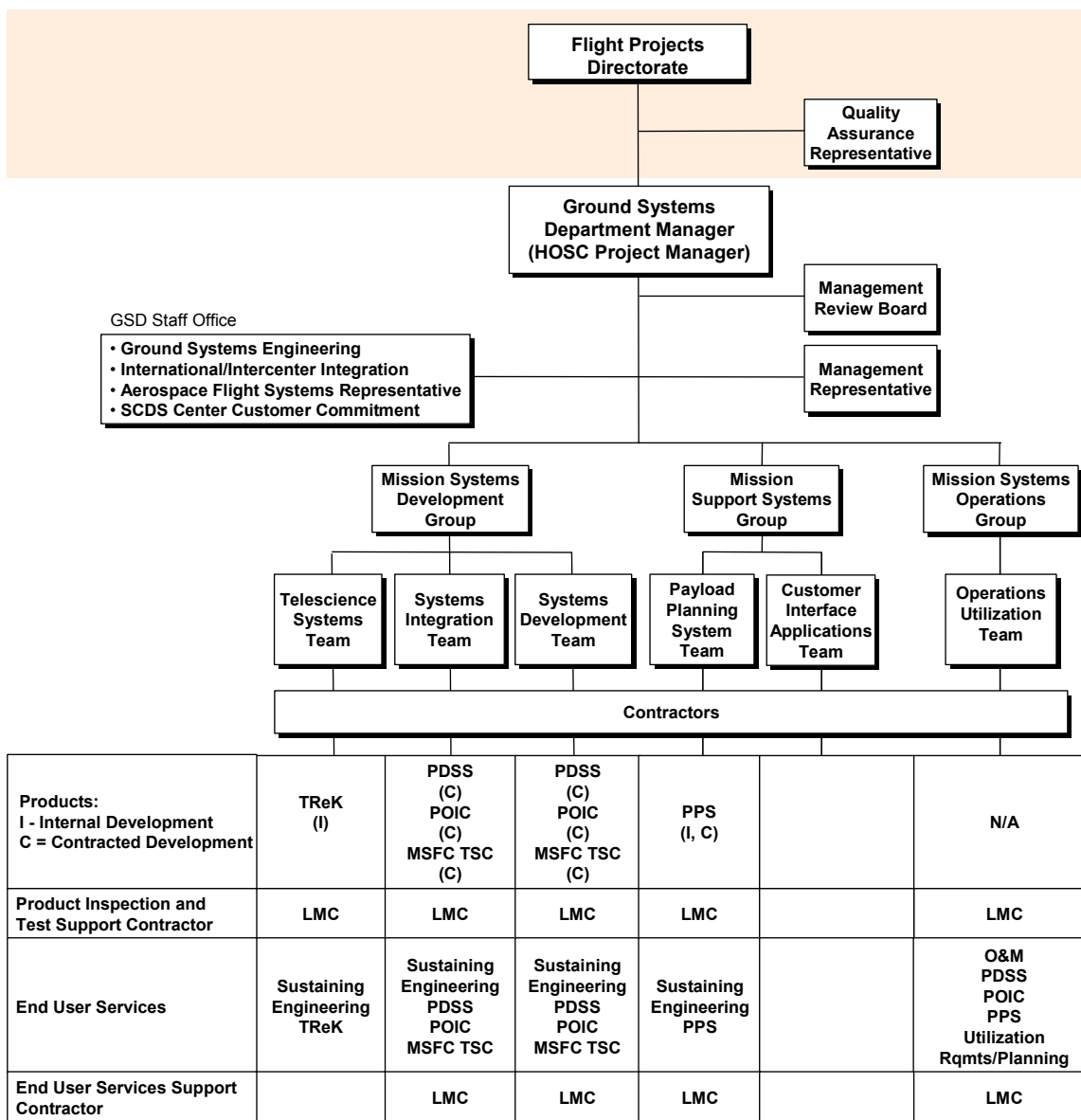


Exhibit 7.1.1.4-1. GSD/HOSC Project Quality Organization

Project civil service personnel perform in various roles:

- The Telescience Systems Team is developing a software/hardware capability referred to as the Telescience Resource Kit (TReK). This Team utilizes contractors only for verification and test support.
- The Systems Integration and Development Team primarily provides guidance/surveillance of contracted development of software and hardware. They also monitor/oversee verification and test services procured from contractors.
- The Payload Planning System Team participates with contractors in development and integration of software/hardware systems. They monitor/validate verification and test services procured from contractors.

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- The Customer Interface Application Team primarily provides in-house mission support system software development and systems management support.
- The Operations Utilization Team participates with contractors in delivering operational services to customers/end-users. This includes monitoring and validating contractor-provided services.

7.1.1.4.1 Management Responsibility and Authority

The Project Manager has overall authority and responsibility for the quality of products and services. This includes:

- Reviewing, approving, assuring implementation, and continuously improving this Quality Plan;
- Assuring control of the elements of this plan and monitoring progress during execution of this Project;
- Acting on recommendations relating to product and safety/quality system improvements that are submitted to management for review and approval;
- Communicating requirements peculiar to the specific product, project, or contract to all affected Groups, Teams, contractors and customers, and resolving problems that arise at the interfaces between such organizations;
- Ensuring that communication takes place regarding the effectiveness of the safety/quality management system;
- Reviewing and approving product implementation plans (PIP);
- Authorizing requests for exemption from quality system elements;
- Ensuring that all organizations involved are aware of their responsibility to initiate corrective and preventive actions relating to product or process nonconformities;
- Ensuring all corrective and preventive actions are monitored for effectiveness using various process improvement tools and periodic internal audits; and
- Reviewing the results of any audits conducted.

The Group Leads are responsible for the quality of the products and services provided by the civil service and contractor personnel associated with the Group. This includes assurance that the requirements of this Quality Plan and PIPs are met within all Group activities.

The Team Leads are responsible for the quality of the products and services provided by the civil service and contractor personnel associated with the Team. This includes assurance that the requirements of this Quality Plan and any PIPs are met within all Team activities.

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Utilization of the various elements/procedures is distributed across the GSD as shown in Exhibit 7.1.1.4.1-1.

ISO 9000 Element	Project Manager	Management Rep	GSD Staff Office	Resources Office	EHS	TReK	PPS	MSO
7.1.1 Management Responsibility	◆	◆			❖	❖	❖	❖
7.1.2 Quality System	◆	◆			❖	❖	❖	❖
7.1.3 Customer-Related Processes	◆				❖	❖	❖	❖
7.1.4 Data Mgt/Document & Data Control	❖				◆	◆	◆	◆
7.1.5 Process Control	❖				◆	◆	◆	◆
7.1.6 Corrective and Preventive Action	❖	◆	❖		❖	❖	❖	❖
7.1.7 Control of Quality Records	❖	❖	◆	◆	◆	◆	◆	◆
7.1.8 Quality Audits	❖	◆	❖	❖	❖	❖	❖	❖
7.1.9 Servicing	❖				❖	❖	❖	◆
7.3.1 Competence, Awareness, and Training	◆	◆	◆	◆	◆	◆	◆	◆
7.4.1 Control of Customer-Supplied Product	❖						◆	◆
7.5.1 Purchasing	❖			◆	❖	❖	❖	❖
7.6.1 HSPPD	❖				◆	◆	◆	◆
7.7.1 Quality Planning	◆				❖	❖	❖	❖
7.8.1 Design and Development	◆				❖	❖	❖	
7.8.2 Product Identification and Traceability	❖				◆	◆	◆	◆
7.8.3 Inspection and Testing	❖				◆	◆	◆	◆
7.8.4 Control of Inspection, Measuring & TE	❖				◆	◆		◆
7.8.5 Inspection and Test Status	◆				❖	❖	❖	❖
7.8.6 Control of Nonconforming Product	❖				◆	◆	◆	❖
7.8.7 Statistical Techniques	❖		◆		◆	◆	◆	◆

◆ Directly use
 ❖ Interface with

Defined in Quality Plan Defined in PIP

Exhibit 7.1.1.4.1-1. Element/Procedure Utilization

Specific procedures used within the projects are defined in product implementation plans, as discussed in Section 7.7.1. Development and maintenance of the procedures, as included in this Plan and as may be included in standalone documents, is assigned to “owners,” as summarized in Appendix A.

7.1.1.4.2 Resources

The Project Manager provides sufficient resources to implement and maintain the safety/quality management system and continually improve its effectiveness. This includes the assignment of trained personnel for management, performance of work, verification of performance and internal audits. The

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focus is on enhancing customer satisfaction by applying resources which are sufficient to satisfy customer requirements. Resource responsibility provisions include human, infrastructure and the work environment resources.

7.1.1.4.3 Management Representative

The Project Manager has designated a management representative (MR) who has defined authority to ensure that the quality system is established, implemented, and maintained in accordance with this Quality Plan. The MR reports on the performance of the quality system to the Project Manager for review and as a basis for improvement of the quality system. The MR ensures the awareness of the importance of customer requirements throughout the organization. The MR has the organizational freedom to resolve matters pertaining to quality.

7.1.1.5 Management Review

Management reviews are conducted in accordance with MPG 1280.1, Management Review. Meetings are normally held on the fourth Thursday of each month. The review combines the aspects of risk management, continuous improvement, preventive action and corrective action. The Management Review Board (MRB)/Risk Review Board (RRB) is composed of the Project Manager, the Group Leads, the Team Leads and the MR. These meetings include ensuring continuing suitability, adequacy and effectiveness of the quality management system and determining whether the stated objectives or defined incremental targets to the objectives have been and/or are being achieved.

The input to these reviews includes information on results of audits, customer feedback, process performance and product conformity, status of preventive and corrective actions, risks, issues and threats, follow-up actions from previous management reviews, changes that could affect the quality system, and recommendations for improvement.

The output from these reviews includes any decisions and actions related to improvement of the effectiveness of the quality system and its processes, improvement of the products related to customer requirements, and resource needs.

Records of these meetings are maintained in the continuous improvement database to show what decisions were made, incremental targets for quality goals/objectives, and who is responsible for their implementation (reference Section 7.1.7).

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7.1.2 Quality System

7.1.2.1 General

MSFC has established and continually improves the MSFC Management System (MMS) as a means of ensuring all MSFC products and services conform to specified requirements and to ensure conformance to NPD 1280.1, ANSI/ASQC Q9001, SAE AS9100A, and regulatory requirements. This MMS is documented in MPD 1280.1, Marshall Management Manual. The controlled version is available to HOSC Project, Project customers, and regulatory personnel on the World Wide Web (WWW) via the MSFC Management Directives Master List at <https://repository.msfc.nasa.gov/directives/directives.htm>. The MMM defines second-tier MSFC documents (MPDs, MPGs, etc.), which provide MSFC processes and procedures for each ISO requirement, as illustrated in Exhibit 7.1.2.1-1. These processes/procedures are compliant with AS9100A requirements.

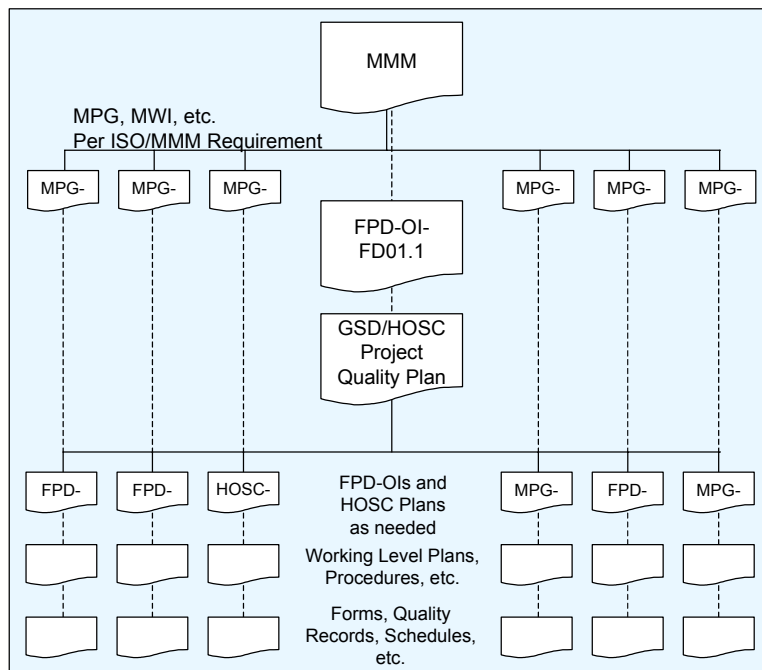


Exhibit 7.1.2.1-1. Documentation Hierarchy/Compliance

These second-tier MSFC documents are generally applicable to MSFC's role as a space product developer. Many of these documents provide guidance which is directly applicable to the HOSC Project's role of providing space operations support systems and services. In these cases, the Project uses the MSFC procedures directly. In this regard, and to the extent applicable, this plan defines the linkages between the MSFC documents, this plan, and the lower levels of GSD/HOSC Project documentation/procedures.

7.1.2.2 Quality System Procedures

As illustrated in Exhibit 7.1.2.1-1, the Flight Projects Directorate (FPD) and the GSD/HOSC Project have established documented procedures as needed to supplement the MSFC second-tier procedures. This Quality Plan serves as the HOSC Project quality manual. The Project level procedures comply with the MSFC and FPD procedure guidance and provide details of GSD/HOSC-specific implementation. In combination, the MSFC, FPD, and Project procedures provide the specific directives, guidance, and instructions necessary to fulfill the role of providing space operations support systems and services, as are required by the Project customers.

The overall process is illustrated in Exhibit 7.1.2.2-1.

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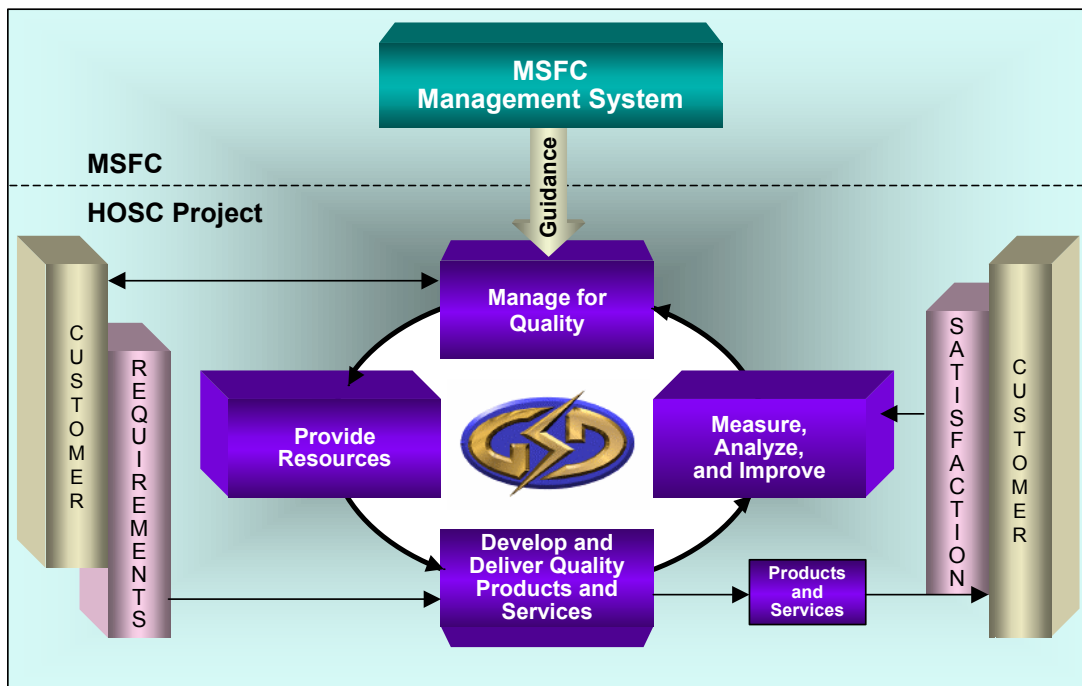


Exhibit 7.1.2.2-1. Process Model

This process starts and ends with the Project's customers. All activities are directed toward customer satisfaction and activities are defined by documented procedures.

The procedures provide levels of detail appropriately matched to the training and experience of the personnel executing the procedures. The Project procedures are maintained in a continuous improvement manner by the procedure owners under the guidance of the MRB. This continuous improvement is focused on ensuring ever increasing customer satisfaction and on ensuring on-going compliance with the applicable standards. Procedure owners and cross-correlation with MSFC second-tier documents are summarized in Appendix A.

The controlled versions of the Flight Projects Directorate procedures are available to HOSC Project, Project customers, and regulatory personnel at <http://flightprojects.msfc.nasa.gov/iso9000.html>. The controlled versions of the applicable/relevant GSD organizational instructions, HOSC plans and working level instructions are defined in the product implementation plans (reference Section 7.7.1). These documents are available to HOSC Project, Project customers, and regulatory personnel at the websites defined in MSFC-PLAN-3046, Data Management Plan for the HOSC.

Group and Team Leads ensure project personnel are aware of and using the processes applicable/relevant to their work in implementing the product implementation plans.

Document approval is as defined in MSFC-PLAN-2929, Configuration Management Plan for the HOSC Project.

7.1.2.3 Analysis of Data

The Project determines, collects and analyzes appropriate data to demonstrate the suitability and effectiveness of the safety/quality system and to evaluate where continual improvement of the effectiveness of the system can be made. This includes data generated as a result of monitoring and measurement and from other relevant sources.

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The analysis of data provides information relating to:

- a) Customer satisfaction (see Section 7.1.3.5)
- b) Conformity to product requirements (see Section 7.8.3)
- c) Characteristics and trends of processes and products including opportunities for preventive action, (see Section 7.1.5.5) and
- d) Suppliers (see Section 7.5.1.2 and 7.5.1.4).

7.1.2.4 Continual Improvement

The Project continually improves the effectiveness of the quality system through the use of the policy, objectives, audit results, analysis of data, corrective and preventive actions and management review (see MPG 1280.9, Continual Improvement, and Sections 7.1.1.5 and 7.1.6).

7.1.3 Customer-Related Processes

7.1.3.1 General

Customer requirements are defined as discussed in HOSC-PLAN-623, HOSC Project Plan, Section 9.1 by the Customer Agreement review process. This includes any Intercenter Task Agreement (ITA) and Collaborative Work Commitment (CWC) wherein the Project agrees to provide products and/or services (reference MPG 1230.1, Center Resources Management Process). Customer Agreements/CWCs define the technical requirements, schedule commitments, goals/objectives, and budget that are agreed-to by the Project Manager and the customer. These top-level requirements are supplemented by detailed requirements using processes as defined in MSFC-PLAN-2929, Configuration Management Plan for the HOSC, or similar approved procedure as specified in the PIP (reference Section 7.7.1).

An amendment to a Customer Agreement/CWC is made by negotiation with the customer to include top-level and detailed requirements. Approval of amendments is by the Project Manager as described in the HOSC Project Plan, Section 9.1. Technical (detail) changes are communicated to the affected organizations using processes as defined in MSFC-PLAN-2929 or the PIP.

Records of Customer Agreements/CWCs and their amendments are maintained as required by MPG 1050.1 and discussed in Section 7.1.7.

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7.1.3.2 Determination of Requirements Related to Products

The Project determines requirements specified by the customer, including the requirements for delivery, acceptance and post-delivery activities; extent of customer participation in developed and/or contracted system development; configuration identification and media required for each item including (as applicable) software, definition of the operating system/hardware platforms, agreement on interface control requirements, maintenance requirements and documentation requirements. The Project also determines requirements not stated by the customer but necessary for specified or intended use - where known, statutory and regulatory requirements related to products, and any additional requirements determined. This determination is by the process defined in Section 7.8.1.4.

7.1.3.3 Review of Requirements Related to Products

The Project reviews the requirements related to products. This review is conducted prior to commitment to supply a product to a customer (e.g. submission of tenders, acceptance of contracts or orders, acceptance of changes to contracts or orders) and ensures that product requirements are defined, requirements differing from those previously expressed are resolved, and that the Project has the ability to meet the defined requirements. Risks involved with product delivery (e.g., short time allowed) are

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evaluated and documented. Records of the results of these reviews and actions arising from these reviews are maintained as defined in MSFC-PLAN-2929 or the PIP (see Section 7.1.7).

Where the customer provides no documented statement of requirement, the customer requirements are confirmed by the Project before acceptance. Where product requirements are changed, the Project ensures that relevant documents are amended and that relevant personnel are made aware of the changed requirements.

7.1.3.4 Customer Communication

The Project determines and implements effective arrangements for communicating with customers in relation to product information; enquiries, contracts or order handling, including amendments; and customer feedback, including customer complaints. These processes are primarily discussed in Section 7.1.3.1-3, 7.8.1 and 7.1.6, respectively.

7.1.3.5 Customer Satisfaction

As one of the measurements of the performance of the quality system, the Project Manager and Group/Team Leads monitor information relating to customer perceptions as to whether the Project consistently meets customer requirements. The methods for obtaining and using this information are defined in MPG 1280.8, Customer Satisfaction and implemented through the HOSC User Survey and “How Are We Doing?” Survey (reference Sections 7.1.6 and 7.1.1.3).

7.1.4 Data Management, Including Document and Data Control

“Documentation” refers to the plans, procedures, and instructions that guide HOSC Project activities. “Data” includes the documentation and related records.

7.1.4.1 General

Documentation and data control is as specified in MSFC-PLAN-2929, Configuration Management Plan for the HOSC, and MSFC-PLAN-3046, Data Management Plan for the HOSC. These plans are in compliance with MWI 8040.1, Configuration Management Plan, MSFC Programs/Projects, and MWI 7120.5, Data Management, MSFC Programs/Projects – respectively.

7.1.4.2 Document and Data Approval and Issue

The documents and data (hardcopy and electronic media) are reviewed and approved for adequacy by the control procedures listed in MSFC-PLAN-2929 or the PIP. The levels and authority for the HOSC System Level III are controlled by the MSFC HOSC Management Coordination Group (HMCG) Configuration Control Board (CCB) for all programmatic requirements and the top-level HOSC requirements documents, configuration documents, implementation documents, plans, processes, procedures, standards, and Level III HOSC MSFC ICDs. The Level IV responsibilities are defined in the Configuration Management Plan.

The documents and data are reviewed and approved for adequacy and accuracy prior to issue to perform work by the boards, or designee, after having received concurrence by technical authorities and employee representatives performing the tasks. Each Team maintains the documents and data or identifies the repository location of the documents and data such that each employee who is performing the task can easily retrieve the applicable documents/data for use. These documents can be in the form of any type of media; electronic media is recommended when available. Master lists identifying the current revision status of documents, as well as previous versions authorized for use, are established and readily accessible from a central location to preclude the use of invalid and/or obsolete documents. These lists and the manner of access to the documents are defined in the Data Management Plan. This control ensures that:

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- Pertinent issues of appropriate documents are available at all locations essential to the effective functioning of the quality system
- Invalid and/or obsolete documents are promptly removed from all points of issue or use, destroyed, or otherwise ensured against unintended use
- Any previous/obsolete version of any documents within the system retained by the user (e.g., for limited applicability, for historical purposes, for reference) will be:
 - Marked, OR
 - Otherwise suitably identified.

7.1.4.3 Document and Data Changes

Changes, revisions, and cancellations to documents and data are reviewed and approved by the control procedures listed in the Configuration Management Plan, Data Management Plan, or the PIP. The designated functions/organizations have access to pertinent background information upon which to base their review and approval as provided for in the procedures. Where practicable, the nature of the changes are identified in the document or the appropriate attachments. Changes are coordinated with customers and/or regulatory authorities in accordance with customer or regulatory requirements.

7.1.5 Process Control

The HOSC Project provides production (implementation of designs), installation (setting up products in internal and customer facilities) and servicing (operation and sustaining engineering of products). Products are a combination and integration of software, hardware and related documentation. Software and documentation are produced internally and by contractors.

For the case wherein civil service personnel provide production, installation and servicing (e.g., TReK), process control is in accordance with the techniques/methodologies defined in the Project Manager-approved product implementation plan.

For the case wherein a contractor provides production, installation and servicing, process control is defined and performed by the contractor. The GSD/civil service role is to:

- Ensure the contractor proposes effective process control during the purchasing process including the change control, master retention and safeguarding, and any support processes (Section 7.5), and
- Ensure sufficient insight of contractor process control through the design control reviews (Section 7.8.1), through inspection and testing of contractor products evolution (Section 7.8.3), and through assurance that PIP-defined procedures are used.

For the case wherein civil service and contractor personnel collaborate in production, installation, and/or servicing, the civil service role is to:

- Ensure the process control is in accordance with the techniques/methodologies defined in the PIP including the change control and master retention and safeguarding process, and
- Ensure sufficient insight of the contractor portion of the process control.

7.1.5.1 Infrastructure

The Project determines, provides, and maintains the infrastructure needed to achieve conformity to product requirements. Infrastructure includes, as applicable:

- a) Buildings, workspace, and associated utilities
- b) Process equipment (both hardware and software), and

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c) Supporting services (such as transport or communication).

Infrastructure effectiveness is measured through the problem report system and the “How Are We Doing” surveys (reference Section 7.1.6).

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7.1.5.2 Control of Production and Service Provision

Procedures and instructions are developed on an ongoing basis by the responsible organizations to ensure functional activities are performed under controlled conditions. Process controls for hardware and software products are carried out in accordance with MPG 1280.2, Process Control. Process controls for post-delivery servicing activities are carried out in accordance with MPG 1280.7, Servicing.

Production of hardware, software and related documentation is provided by Project personnel who are specifically trained in their development.

- The procedures used are as defined in the PIP. These procedures are available for access/use via the websites specified in the Data Management Plan.
- Reference standards are defined by the design process to include aspects such as telemetry, command, database, and documentation standards. These are described in the PIP and/or by the standards shown in the documentation trees.
- Any development/production performed in off-site facilities is planned and controlled as defined in the PIP.
- Customer-defined functional and performance requirements and corresponding Project-defined system requirements are documented and available for developer access. Reference Section 7.8.1.4.
- Identification and traceability are as defined in Section 7.8.2.
- Change control (requirements, plans, processes, etc.) is as defined in the CM Plan.
- Development and capability progress is monitored and controlled by the Project Manager and Group/Team Leads through contractor/project surveillance, verification and audits, as described in Section 7.8.1.
- Software/code production and integration processes involve a high degree of technical creativity by highly trained individuals (engineers/analysts/programmers). Quality assurance of these fundamental processes is through stringent application of employment standards and application of recognized software life cycle processes, as defined in the PIP.
- Leads and Change Package Engineers are accountable for products in development or change.
- Installation procedures are developed and documented for delivery with the products. The developers of the products are available to assist in installation, as needed. Inspection and testing of installed products are discussed in Section 7.8.3.
- Maintenance documentation is developed to facilitate supportability and sustaining engineering of the product, as appropriate.
- User guidance documentation is developed for aspects such as product installation, required platform configuration and troubleshooting. This guidance is typically provided through help menus and/or web pages.
- Workmanship is measured in terms of the output products satisfying the design requirements and ultimately the quality goals.
- The equipment (computers, workstations, networks) used for IT production is maintained in preventive and remedial modes by the Mission Systems Operations Group.
- Calibrations are maintained as discussed in Section 7.8.4.

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- Backup electrical power is provided for critical systems.

For software, process control includes consideration of and as applicable procedures for:

- Inclusion for disaster recovery plans including custody and location of master/backup copies.
- Addition of requirements to include description of the various types of release, with consideration of the nature and importance of change.
- Methods defined by which the customer will be advised of software modifications or changes during release or maintenance.
- Methods to confirm software releases will not introduce or reintroduce problems, methods should include determination of the level of regression testing.
- Inclusion of ground rule requirements for implementation of localized temporary fixes of patches vs. revision of software release and/or configuration item.
- Requirement for records indicating which changes have been implemented and when, including for multiple hardware platforms and locations.
- Processes to identify and safeguard against introduction of viruses and unauthorized code.

Servicing is a very important aspect of the Project, since the products which are developed are utilized in support of space flight operations. As such, Project products (systems) are: complex, uniquely suited for the environment, subject to stringent security constraints, and subject to around-the-clock synchronous utilization in coordination with other flight and ground facilities. To address this, a highly trained team of specialists (the Integrated Support Team (IST)) is dedicated to performing system and facility operations and maintenance (O&M) and user/customer assistance in utilization of the HOSC Project products/systems. In addition, this IST assists users/customers by operating the infrastructure systems which provide the users/customers with interfaces to the balance of the overall flight and ground system. Within this servicing/IST environment:

- The IST is composed of both Mission Systems Operations Group (MSOG) (civil service) and contractor personnel.
 - MSOG personnel provide oversight of all servicing/O&M activities.
 - MSOG personnel are assigned on an 8 hour per day, 5 day per week tour. Contractor console positions are staffed on a 24 hour per day, 7 day per week schedule as authorized by funding. This is subject to be changed per the program office (customer's) direction and funding allocation.
- The IST is authorized to implement repairs to systems, subsystems and components which fail.
- The IST is supported by the developers and integrators of the operational systems. The developers/integrators provide sustaining engineering for purposes of design/implementation error correction and for systems updates/upgrades. This includes updating of technical documentation.
- Service data are collected and analyzed versus the Project objectives and commitments listed in the Project Plan. Reference Section 7.8.7.

Specific servicing procedures are as follows:

- System and communications interface operations procedures are documented in the HOSC-HUH-233, HOSC User Handbook, and HOSC-PROC-180, HOSC Standard Operating Procedures.
- Operational procedures are subject to various levels of NASA (Levels III and IV) and contractor (Level V) approval, as defined in the PIP or MSFC-PLAN-2929.

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- Workmanship criteria are defined by the operating procedures.
- All servicing procedures are verified and validated through tests and simulations. The IST personnel and users are trained as described in FPD-OI-FD43.1, Ground Systems Operations. Facility procedures are found in MSFC-PROC-1933, HOSC Access Procedures, MSFC-PLAN-2934, HOSC Emergency and Disaster Recovery Plan, and HOSC-HDBK-003, HOSC Facilities Document.
- System configurations for specific operational support activities are defined in the HOSC Mission Configuration Supplement.
- Problems are identified and resolved by the process described in FPD-OI-FD40.10, HOSC Problem Report.
- A local service/help desk (256-544-5066) operated by the IST provides on-line assistance to remote and local users of Project products.

Records are maintained for qualified procedures and personnel, such as described in FPD-OI-FD43.1, Ground Systems Operations or as defined in the PIP.

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Any service-related work performed at off-site facilities is planned and controlled as defined in the PIP.

7.1.5.3 Work Environment

The project determines and manages the work environment needed to achieve conformity to product requirements. Factors that may affect the conformity of the product include temperature, humidity, lighting, cleanliness, protection from electrostatic discharge, etc. Work environment effectiveness is measured through the Problem Report system and the “How Are We Doing” surveys (reference Section 7.1.6).

7.1.5.4 Validation of Processes for Production and Service Provision

The nature of the Project’s processes for production and servicing is such that their effectiveness can be verified by subsequent monitoring and measurement.

7.1.5.5 Monitoring and Measurement of Processes

Process effectivity is measured and monitored through analysis of the records, as defined in Section 7.1.7. Any potential or actual shortfall in effectiveness is acted upon via the corrective and preventive action processes of Section 7.1.6.

7.1.6 Corrective and Preventive Action and Continuous Improvement

The objective of corrective and preventive action is to drive the continuous improvement of GSD processes and procedures and the resulting conformity/quality of Project products. Corrective and preventive actions are focused on the root causes of actual or potential product/service nonconformities. They provide the answer to the question: What is it about the process/procedure that allows/causes defective products or services to be delivered? Then they provide for fixing the process/procedure. Note, this is not about the defects themselves, it is about why the defects occur.

Corrective action is about fixing a process/procedure problem, when defects/customer complaints have already occurred (e.g., poor user survey input). Preventive action is about fixing a process/procedure before problems/defects/customer complaints actually start (i.e., identifying a risk and acting to avoid the potential defects/complaints before they happen).

Acute Launch Emergency Restraint Tips are special classes of preventive actions and are discussed in Section 7.1.6.3.

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The overall continuous improvement process is illustrated in Exhibit 7.1.6-1. Note that the process steps are essentially the same for corrective actions and preventive actions. (The only difference is the 'likelihood of occurrence' step. The likelihood of occurrence is obviously 100% for corrective action cases.)

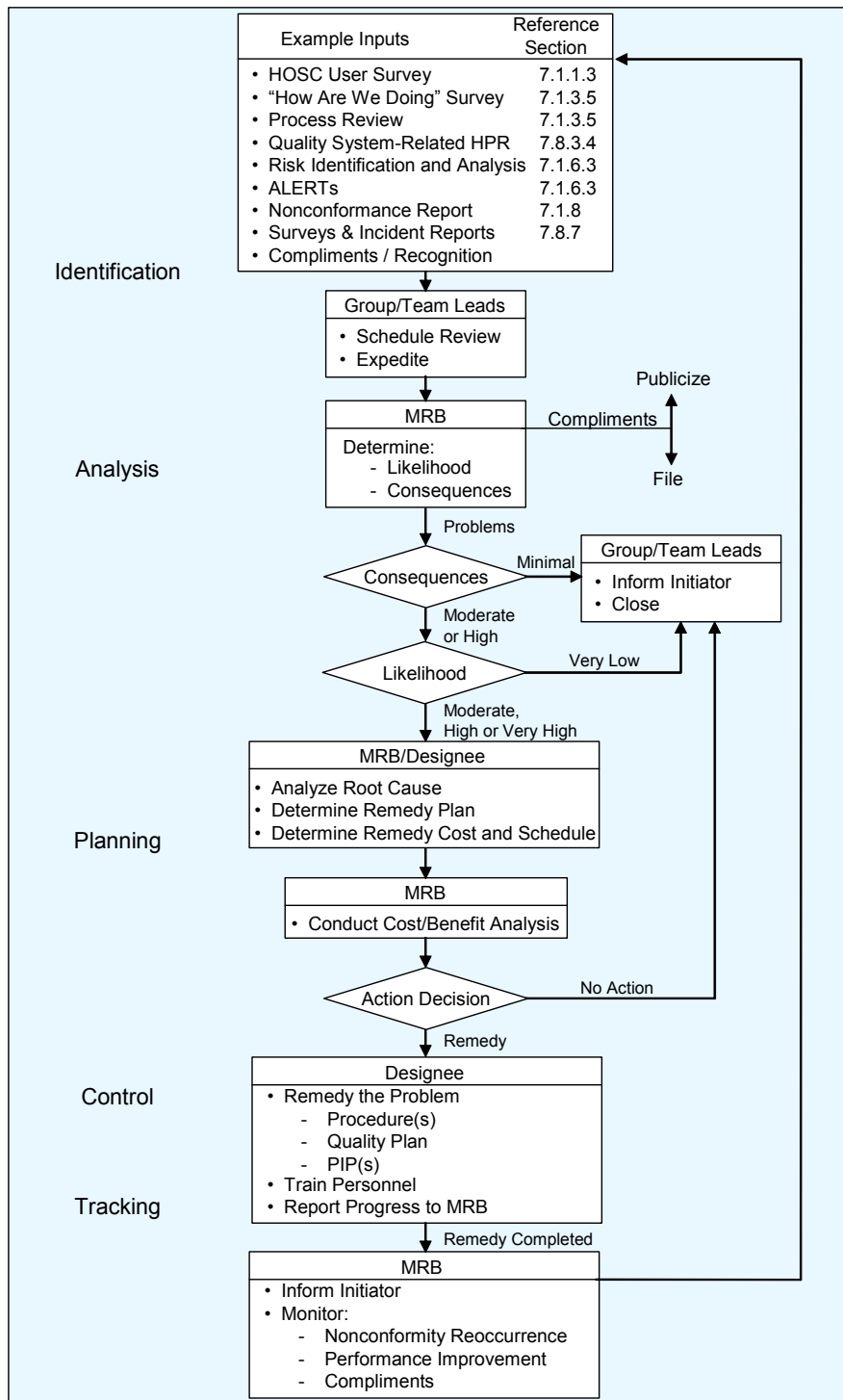


Exhibit 7.1.6-1. Continuous Improvement Process

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This continuous improvement process has these characteristics:

- It deals with a wide variety of inputs,
- It ensures that positive/good performance is recognized,
- It ensures that positive/good, as well as bad, lessons learned are captured/documented in a database for re-use,
- It ensures that opportunities for improvement (inputs) are identified and analyzed and that actions are planned consistent with the magnitude of the problem and cost/benefit of the action. It includes applying control to ensure the remedy is well thought out, and it includes tracking both the progress of the process/procedure changes and the effectivity of those changes.
- It identifies who is responsible for each step of the process. Note, the exhibit shows the overall GSD process assignments. This process is also naturally suited to teams within the GSD. That is, for actions that are conducted at the Group/Team level, the Group/Team Lead would logically provide the role of the MRB and personnel within the Group/Team would provide the role of the 'designee'.
- It is applied to address internal/government processes and the supporting processes of suppliers/contractors.
- It ensures feedback to the input initiator.

The following paragraphs provide additional detail for use of the continuous improvement process for corrective and preventive actions respectively.

7.1.6.1 Corrective Action

Corrective actions are handled as generally defined in MPG 1280.4, MSFC Corrective Action System. They follow the process of Exhibit 7.1.6-1.

- Customer complaints and reports of nonconformities are documented and tracked using the HOSC User Survey, HOSC Problem Report System, How Are We Doing Survey, or other PIP-defined problem reporting system. Continuous improvement (CI) suggestions are documented and submitted via the on-line CI database. Quality system-related nonconformities (e.g., why didn't the delivered product meet the customer's requirements?) and improvement suggestions are segregated from system defects/deficiencies and sent to the Group/Team Lead. Adverse trends (reference Section 7.8.7) are also reported. The Group/Team Lead presents the reports of nonconformity to the MRB (reference Section 7.1.1.5) on a routine or expedited basis depending on the nature of the nonconformity. The MRB routinely meets monthly; continuous improvement is handled in parallel with risk management. **R**
- The MRB analyzes the nonconformity or CI suggestion to determine the actual and potential consequences of the problem or CI opportunity. This analysis may include the use of statistical techniques (reference Section 7.8.7). If the consequences (i.e. impact to service) are minimal, the MRB may decide to close the action. Closure includes informing the initiator of the decision. In cases wherein the consequences of the nonconformity may involve significant damage to the GSD's performance, or the CI suggestion could be of significant benefit, the MRB directs further action.
- Investigation of nonconformities/complaints/improvements is assigned to the systems engineer or lead responsible for the particular products or process. The investigation determines the root cause of a nonconformity or improvement opportunity to include design/production/V&V/etc. procedure shortfall as well as quality system and/or skill shortfall. It includes derivation of a plan for remedying and/or improving the **R**

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nonconforming/deficient process/procedure as well as the resources (cost and schedule) needed for the remedy/improvement. The findings of the investigation are documented by the assignee and presented to the MRB. The CI database administrator enters investigation and status documentation into the CI database.

- d) The MRB ensures the soundness of the remedy/improvement plan and compares the resources required with the intrinsic benefit to be derived (cost/benefit analysis). If it is determined that the cost exceeds the benefit, the action is closed and the initiator is informed of the decision. In cases wherein the benefits outweigh the cost, the MRB directs action to implement the remedy.
- e) Implementation of the corrective action/remedy/improvement is assigned to the systems engineer, process owner and management, with regular reporting of progress and measured effectivity back to the Management Review Board. Assignees are responsible for ensuring changes to processes and the quality system are documented in the appropriate procedure and in the respective document change logs, as well as for implementing appropriate training regarding the changes. Records of corrective actions and improvement suggestions are maintained in the CI database.
- f) Any corrective action wherein the desired results are not achieved (being achieved) in an effective and/or timely manner are dispositioned by the MRB.
- g) Subsequent to completion of corrective action, the MRB monitors the effectivity of the process/procedure improvement action.

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Corrective actions required to correct contractor discrepancies follow MPG 5000.1, MWI 5116.1, and related instructions, including FPD-OI-FD40.13.

Corrective actions for mishaps follow MWI 8621.1, Close Call and Mishap Reporting and Investigation Program.

In the event of process nonconformity, the Project evaluates whether the process nonconformity has or could result in product nonconformity. If product nonconformity has occurred, it is handled as discussed in Section 7.8.6.

7.1.6.2 Preventive Action

Preventive actions are defined/designed to eliminate or abate conditions which, if not addressed now, could lead to product nonconformities and customer complaints in the future. Such actions are generally derived from the procedures of HOSC-PLAN-635, Risk Management Plan for the HOSC Project. This plan/procedure:

- Follows the process of Exhibit 7.1.6-1
- Is initiated by a Risk Identification and Analysis Form, an on-line database complementing the CI database, and
- Is the same as for corrective action except that the probability of occurrence is considered as a factor in the decision to take action and records are maintained in the risk management database.

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7.1.6.3 ALERT

Acute Launch Emergency Restraint Tips (ALERTs) are reports on hardware, software, databases, or procedures that could potentially cause problems/nonconformances for the HOSC Project or for HOSC Project customers or suppliers. ALERT reports generated externally (outside the HOSC Project) are reviewed by the Project to determine if they will/could cause a HOSC Project nonconformance. ALERT reports generated internally (by the HOSC Project) would be a mechanism for the HOSC Project to alert

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its customers and/or suppliers that a HOSC Project product could cause problems for the customers and/or suppliers. ALERTs are processed in conjunction with the HOSC Project risk management process (for incoming ALERTs) and in conjunction with the HOSC problem reporting system (for any outgoing ALERTs). The specific procedure for ALERTs processing is defined in MWI 1280.5, MSFC ALERT Processing.

7.1.7 Control of Records

The Project follows the guidance of MPG 1440.2, MSFC Records Management for the overall management of records. Records are primarily managed and maintained:

- To identify defects and initiate their elimination,
- To provide insight into needs for corrective and preventive action and continuous improvement,
- To track progress of corrective and preventive action and continuous improvement,
- To provide a database of information to facilitate determination of the root cause(s) of defects and nonconformities (e.g., customer complaints), and
- To facilitate demonstration of quality system conformance to the requirements of MPD 1280.1.

The project uses the process of Exhibit 7.1.7-1 to identify, collect, index, file/store, access, and analyze records. This process works in conjunction with the continuous improvement process of Section 7.1.6.

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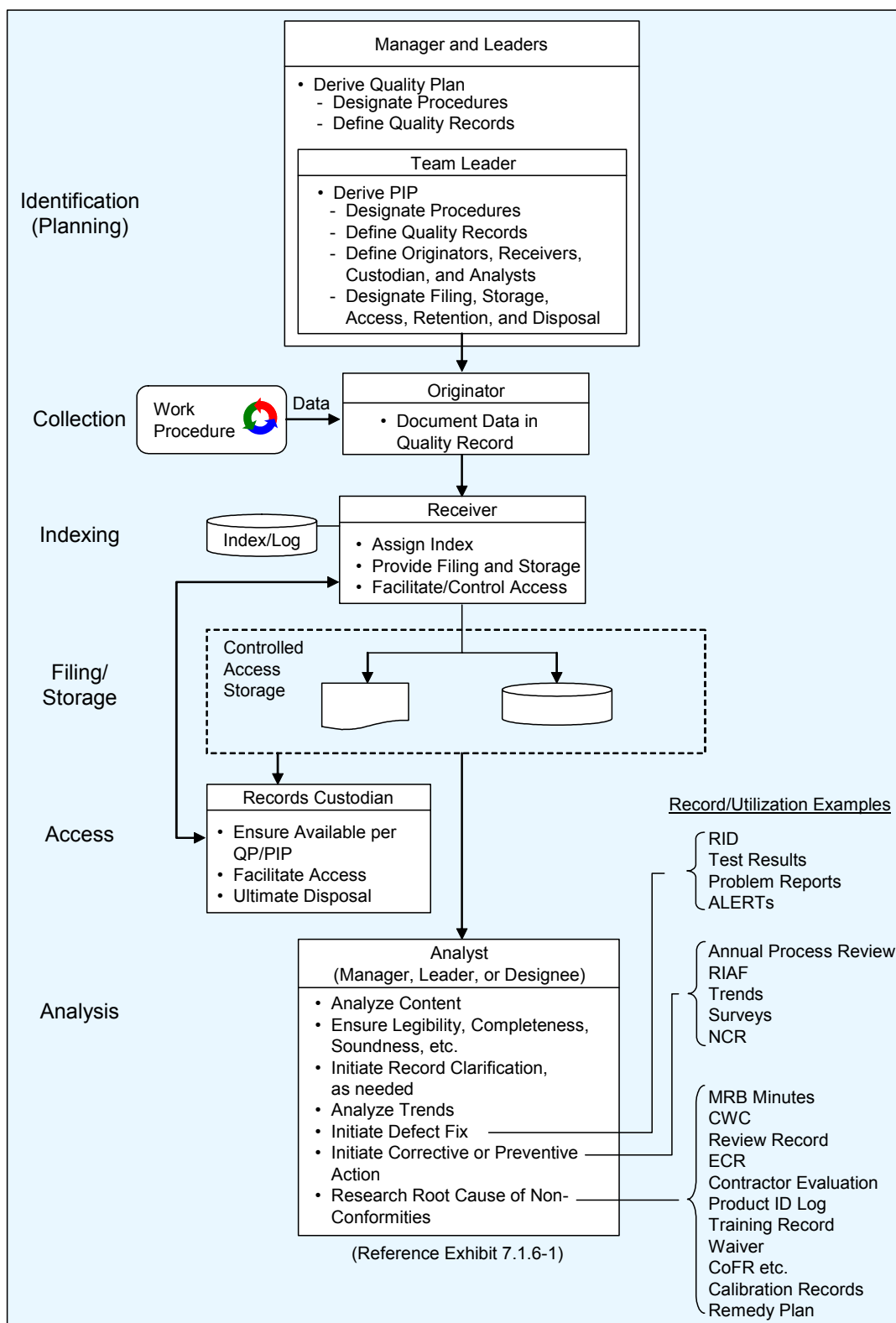


Exhibit 7.1.7-1. Records Process

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Referring to Exhibit 7.1.7-1, record needs are identified in the planning stages of the Project and of any subordinate product development activities. Comprehensive record designations were specified in the activity of developing this Quality Plan. Product-specific records are defined in the development of PIPs. Records are generated by executing the procedures which constitute the Project and/or its subordinate product development/service delivery activities. These documented procedures define the method for controlling records that are created by and/or retained by the Project and by Project suppliers/contractors. The designated record originator documents the data which is called for in the record using standard input forms (e.g., the HPR form). The originator may be a Project employee, customer, user or HOSC Project support contractor – depending on the procedure in execution. If the originator is a customer/user, the record is forwarded to a HOSC Project “receiver,” who indexes it and provides for filing/storage and access. (For HOSC Project developed records, the originator and receiver are generally the same person.) The records are filed/stored/made accessible in paper or electronic form depending on the procedure. The originator, receiver, input form, media, filing/access and retention schedules are as defined in Appendix C for the Project and for each PIP.

The “records custodians” are designated in Appendix C. Their function is to be cognizant of the records assigned to them and to monitor production, filing and storage of the records. The custodian facilitates access by analysts, customers, regulatory authorities, and auditors, and ensures retention as specified in MPG 1440.2 and the NASA Records Retention Schedules.

The ultimate purpose of records is to provide data/information relative to the quality of products, customer satisfaction and the effectivity of the quality system processes and procedures. This data/information is analyzed by the Appendix C-designated “analysts,” using the continuous improvement process of Section 7.1.6 and other appropriate procedures as shown in this Plan and the PIPs. Actions taken are appropriate for the magnitude of the defect/nonconformity described by the record.

Any records having overarching legal/regulatory aspects are handled in compliance with MPG 2190.1, MSFC Export Control Program.

Confidentiality of records is in accordance with MWI 1382.1, Protection of Privacy Act Information at MSFC, MPD 2210.1, Documentation Input and Output of the MSFC Documentation Repository, MPG 2220.1, Scientific and Technical Publications, and/or MPG 1600.1, MSFC Security Procedures and Guidelines.

7.1.8 Audits

The HOSC Project Quality System is subject to audits of an internal nature and an external nature. Internal audits are conducted by Project personnel, while external audits are conducted by representatives of MSFC Safety and Mission Assurance (S&MA), the MSFC ISO 9001 Registrar, or customer personnel. Internal audit frequencies are defined by the GSD Management Review Board and external audit frequencies are defined by the MSFC Quality Council. The general process for planning and conducting audits is defined in MPG 1280.6, Internal Quality Audits.

All audit results are used to improve the overall Quality System, as depicted in the process of Exhibit 7.1.8-1. (Note, this process is integral with the process of Exhibit 7.1.6-1.)

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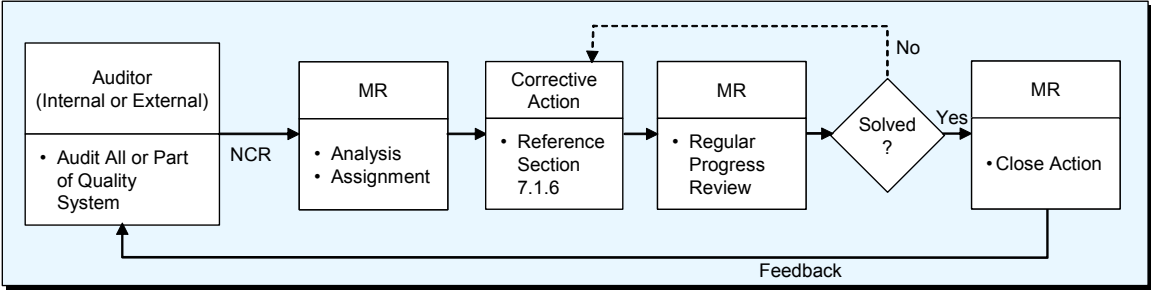


Exhibit 7.1.8-1. Audit/Remedy Process

The Management Representative (MR), defined in Section 7.1.1.4.3, provides oversight of this on-going process. Audit results generate actions; the actions are assigned for resolution; progress is reviewed regularly; and resolved actions are closed in coordination with the original audit organization. Records are maintained throughout the process, as defined in Section 7.1.7.

7.1.8.1 Internal Quality Audits

Audits are conducted by *internal* auditors for the purpose of continuously improving Project products and services, customer satisfaction, and the safety/quality system itself. In addition, *internal* auditors conduct audits for the purpose of ensuring HOSC Project safety/quality system readiness for *external* audit, which is discussed in Section 7.1.8.4.

Internal audits are scheduled on the basis of the status and importance of the activity to be audited as defined by the Project Manager. Audit schedules are maintained by the MR in the Management Review minutes.

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Internal audits are conducted using the processes defined in MPG 1280.6. Lead/auditors are qualified by training or experience, and are assigned by the Project Manager such that they are independent of the personnel who have direct responsibility for the activity being audited.

Audit results are recorded and processed as shown in Exhibit 7.1.8-1. The management personnel responsible for the audited area are informed of the results and are the primary actionees for taking corrective and preventive actions warranted.

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7.1.8.2 Customer Audits

The program offices which are the Project's customers generally do not conduct formal audits of the HOSC Project Quality System. Any such auditing is defined in the PIP.

7.1.8.3 Audits of Contractors

In general, the Project does not conduct formal audits of contractor quality systems. Any exceptions are specified in the PIP. The Project conducts close surveillance of contractor-generated products and services as summarized in Sections 7.8.1 and 7.8.3.

7.1.8.4 Third-Party Audits

The Project is subject to audit by representatives of the MSFC Safety and Mission Assurance Office – for compliance with the MMS. This may include S&MA coordinated audits by the National Quality Assurance (NQA) organization. Specific HOSC activities may also be subject to customer-defined audit as defined in the PIP. Such audits are conducted using the processes of MPG 1280.6. The HOSC Project Point of Contact (POC) is the MR or the Team Lead in the case of an activity audit. The MR/Lead arranges schedules with the MSFC Audit Manager (AM), coordinates audit logistics with the Audit Team (AT) and with Project personnel, and provides escorts. In addition, the MR/Lead coordinates/tracks

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actions warranted by the audit results (i.e., Nonconformance Reports (NCR)), as shown in Exhibit 7.1.8-1.

7.1.9 Servicing

Servicing of Project products is in compliance with MPG 1280.7, Servicing. HOSC-specific procedures are included in FPD-OI-FD40.7, Remote Servicing Plan, FPD-OI-FD43.1, Ground Systems Operations, FPD-OI-FD40.10, HOSC Problem Report, FPD-OI-FD43.2, HOSC Configuration Request, and MSFC-PLAN-2929, Configuration Management Plan. These documented procedures provide guidance for performing, verifying and reporting that the servicing meets the specified requirements. Resulting records, such as user surveys, are processed.

7.1.9.1 Regulatory and Legislative Requirements

Project products and services are subject to the control requirements of MPG 2190.1, MSFC Export Control Program. Records are maintained of all exports.

7.1.9.2 Industry Codes and Practices

Project servicing is not governed by industry codes or practices.

7.1.9.3 Service Level Agreements

Service Level Agreements are documented in the POIC Capabilities Document (SSP 50304) Section 12 that define specific services, which customers can receive from the HOSC for specific mission periods. The Project Service Level Agreements (PSLA) are very high-level program agreements and commitments. Such agreements may also be documented in "HOSC Mission Configuration Supplements." The fundamental purpose of these documents is to clearly specify the service requirements/agreements and to clearly establish the funding of such services, which the customer must remit to the Project in return.

Once these agreements are established, the Operations Utilization Team works with customers in ensuring their mission unique utilization requirements are implemented (i.e., data circuits, voice, HOSC accounts, etc.). The Operations Utilization Team works in concert with contractors and customers in defining the requirements, ensuring the paperwork is written through Program and GSD pre-established processes (MSFC-PLAN-2929, Configuration Management Plan, FPD-OI-FD43.2, HOSC Configuration Request, HOSC-HUH-233, HOSC User Handbook, HOSC-PROC-180, HOSC Standard Operating Procedures, KSC HB GP60-3, Automated Support Requirements System (ASRS) Handbook, and JSC-27379, Support Requirements System Management Plan) securing funding, and overseeing the contractor's implementation.

7.1.9.4 Training of Customer Personnel

Project software/hardware products/systems and associated operational services are suited for the space flight/operations environment, are subject to stringent security constraints, and are utilized in synchronization with the systems/services of other flight and ground facilities. As such, the users of these products and services require training on their proper/effective/secure utilization. Specific training procedures are defined in the PIP for each product. Records of training are maintained by the trainers to track training effectivity.

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7.1.9.5 Technical Support

Initial and on-going technical support requirements are called out in Customer Agreements/CWCs and in service level agreements (reference Section 7.1.9.3). Specific procedures, such as for problem reporting and change processing are provided in the PIP.

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7.2 Legal and Technical

The Project follows the guidance of MPD 1280.1, Section 7.2 for legal and technical matters.

7.3 Human Resources/Personnel and Administration

The Project follows the guidance as shown in Exhibit 7.3-1 for human resources, personnel, and administrative matters.

Requirement	Process/Document Number
General Personnel Provisions	
Employment (General)	
Employee Performance and Utilization	
Position Classification, Pay, and Allowances	MPG 3300.1 Dual Career Path Promotion Procedure Process
Time and Attendance	MPD 3000.1 MSFC Flexiplace Program MPG 3600.1 Attendance and Leave MPG 3600.2 Time and Attendance Process NPG 3600.1 Attendance and Leave
Personnel Relations and Services	
Insurance and Annuities	
General and Miscellaneous	MPG 1371.1 Procedure for Guidelines for Processing Foreign Visitor Requests MPG 1380.1 Acceptance of Gifts to MSFC MWI 5113.1 Governmentwide Commercial Purchase Card Operating Procedures MPG 9710.1 Travel Process NPD 9710.1 Delegation of Authority to Authorize or Approve Temporary Duty (TDY) Travel
Effective Communications	NASA Correspondence Management Communications Standards and Style/NPG 1450.10
Visual Aid, Graphic, and Publication Production Services	MWI 1520.1 Visual Aid, Graphic, and Publication Production Services
Security	MPG 1600.1 MSFC Security Procedures and Guidelines
Smoking Policy	MPG 1800.1 MSFC Smoking Policy
Information Technology	MPD 2800.1 Management of Information Technology Systems and Services at MSFC MPG 2810.1 Security of Information Technology
Safety	MPG 8715.1 Marshall Safety, Health, and Environmental (SHE) Program MWI 8715.15 MSFC Safety Assessment Program

Exhibit 7.3-1. Human Resources/Personnel and Administrative References

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7.3.1 Competence, Awareness, and Training

The Project Manager and Group Leads use the guidance of MPG 3410.1, Training, to identify competency and training needs and provide appropriate training for civil service personnel. They ensure that personnel performing work affecting product quality are competent on the basis of appropriate education, training, skills and experience. They determine the necessary competence for personnel in coordination with the MSFC Human Resources organization. They provide training on the PIP-specified procedures or take other actions to satisfy these needs and evaluate the effectiveness of the actions taken. They also ensure that personnel are aware of the relevance and importance of their activities and how they contribute to the achievement of the objectives, including quality objectives.

Identification of training needs and provision of training for skills, which are common/cross-cutting are provided through the procedures defined in MPG 3410.1. Elements of this training include this Quality Plan and the procedures referenced throughout this plan. This training is applicable for all GSD personnel and notably for new personnel and for existing personnel in new positions. Skills required for *leadership/direction* of HOSC product design, production and installation are provided through formal education and HOSC-specific experience. Skills required for *support* of product design, production, and installation are provided through formal education and/or industry/discipline experience. Training plans/procedures required for specific projects/activities are defined in the PIP.

Training and certification records for civil service personnel are maintained by supervisors, as required in MPG 3410.1. This includes records of education, training, skills and experience.

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Competence, awareness, and training relative to contractor personnel are as defined in the respective contracts.

7.4 Property and Supply

7.4.1 Control of Customer-Supplied Product

The Project includes handling/control of customer-supplied products in compliance with MPG 4000.1, Control of Customer-Supplied Product. The customer-supplied products include:

- Ground support equipment (GSE) brought into the HOSC by customers/users.
- Configuration/calibration databases provided by Programs/customers, such as Space Station and Shuttle.
- Software modules to be integrated with Project-developed software (i.e., Space Station-provided modules for PPS.)

PIP-defined procedures establish consistent methods for controlling the receiving, handling, processing, verification, storage, maintenance, and shipping of such customer-supplied products. They define:

- a) How products provided by the customer are identified and controlled for verification, utilization, and maintenance.
- b) That verification by the Project does not absolve the customer of the responsibility to provide acceptable product.
- c) The overall methods to be used to verify that customer-supplied products meet the specified requirements.
- d) The overall methods to be used to deal with nonconforming products. The FPD-OI-FD40.10, HOSC Problem Report procedure is used to document database and software module nonconformities and report them to the customer.

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- e) Where applicable, the compliance with and consideration of source licensing requirements and 3rd party software maintenance provisions

GSE is received by the MSFC shipping office and handled in accordance with HUH Section 3.8. GSE is not NEMS tagged.

Customer property can include intellectual property. Proprietary/confidential documentation received by the Project is controlled in accordance with MPG 7120.3, Data Management, Programs/Projects, MWI 7120.4, Documentation Preparation, Programs/Projects, MPG 1600.1, MSFC Security Procedures and Guidelines, and MPD 2210.1, Documentation Input/Output of the MSFC Documentation Repository.

7.5 Procurement/Purchasing

7.5.1 Process

The Project uses documented procedures as prescribed in MPG 5000.1, Purchasing, and MWI 5100.1, Procurement Initiator's Guide, to ensure that purchased products and services conform to specified requirements. The type and extent of control applied to the supplier/contractor and the purchased products and services is dependent upon the effect of the purchased products and services on the overall Project's products and services.

The Project is responsible for the quality of all products and services purchased from suppliers/contractors.

The Project evaluates and selects suppliers/contractors based on their ability to supply products and services in accordance with the Project's requirements. Criteria for selection, evaluation and re-evaluation are established in the MPG 5000.1 process. Records of the results of evaluations and any necessary actions arising from the evaluation are maintained by the Procurement Office.

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The Project:

- Maintains a record of approved suppliers/contractors that includes the scope of the approval.
- Periodically reviews supplier/contractor performance; records of these reviews are used as a basis for establishing the level of controls to be implemented.
- Defines the necessary actions to take when dealing with any suppliers/contractors that do not meet requirements.
- Ensures where required that both the Project and all suppliers/contractors use approved processes.
- Ensures that supplier/contractor quality systems are appropriate for the products and services to be delivered/being delivered.

In the Annual Project Operating Plan (POP) process, the Project Business Office in conjunction with technical management provide operating cost projections by fiscal year to the respective programs. Through an iterative process, requirements and scope are definitized. Upon agreement, the program authorizes cost to be incurred and requirements are executed accordingly. Using this plan, the contractors are provided an overall dollar figure and general guidance in which to build detailed procurement plans.

Adjustments to priorities or work for the contracts follow procedures such as FPD-OI-FD40.12, Task Directives.

7.5.2 Purchasing Data

Purchasing documents (requests for quotes, proposals, contracts, credit card orders, etc.) contain data clearly describing the products and services ordered, as required by MPG 5000.1. This includes, where applicable:

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- Requirements for approval of products, services, procedures, processes and equipment.
- Requirements for qualification of personnel.
- Quality management system requirements.
- The name or other positive identification, and applicable issues of specifications, drawings, process requirements, inspection instructions and other relevant technical data.
- Requirements for design, test, examination, inspection and related instructions for acceptance by the Project.
- Requirements for test specimens (e.g., production methods, number, storage conditions) for design approval, inspection, investigation or auditing.
- Requirements relative to:
 - Supplier/contractor notification to the Project of nonconforming product
 - Arrangements for Project approval of supplier nonconforming material.
- Requirements for the supplier/contractor to notify the Project of changes in product, service, and/or process definition and, where required, obtain Project approval.
- Right of access by the Project, Project customers, and regulatory authorities to all facilities involved in the contract and to all applicable records.
- Requirements for the supplier/contractor to flow down to sub-tier suppliers the applicable requirements in the purchasing documents, including key characteristics where required.

Use of credit cards is in compliance with MWI 5113.1, Governmentwide Commercial Purchase Card Program. Records are retained by the cardholder as defined in MWI 5113.1.

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The Project ensures the adequacy of specified purchase requirements prior to their communication to the supplier/contractor.

7.5.3 Verification of Purchased Product

The Project conducts monitoring, surveillance, inspection or other activities necessary for ensuring that purchased products and services meet the specified purchase requirements. These activities are defined in the Project Plan and in Sections 7.8.1 and 7.8.3.

Verification activities include, as appropriate:

- Obtaining objective evidence of the quality of the products and services from suppliers (e.g., accompanying documentation, certificate of conformity, test reports, statistical records, process control).
- Inspection and audit at the supplier's premises.
- Review of the required documentation.
- Inspection of products upon receipt.
- Delegation of verification to the supplier, or supplier certification.

Purchased products are not used or processed until they have been verified as conforming to the specified requirements unless released under the deviation/waiver procedure.

Where the Project utilizes test reports to verify purchased product, the data in those reports must be acceptable specifications/requirements.

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Where the Project delegates verification activities to the supplier/contractor, the requirements for delegation are defined and a record of delegations is maintained.

Where specified in the CWC, the Project's customer and/or the customer's representative are afforded the right to verify at the supplier's premises and the Project's premises that purchased products and/or services conform to the specified requirements.

Verification by the customer is not used by the Project as evidence of effective control of quality by the supplier/contractor and does not absolve the Project of the responsibility to provide acceptable products and/or services nor does it preclude subsequent rejection by the customer.

7.6 Transportation

The Project follows the guidance of MPD 1280.1, Section 7.6 for matters regarding transportation.

7.6.1 Handling, Storage, Packaging, Preservation, and Delivery (HSPPD)

The general procedures for HSPPD of Project products are documented in MPG 6410.1, Handling, Storage, Packaging, Preservation, and Delivery. Within this context, the principal Marshall Lead Representative (MLR) is the Project Manager. Specific delegations of MLR responsibilities are described in the paragraphs and referenced procedures which follow. These delegations are abbreviated as follows:

MSD	-	Mission Systems Development Group Lead
MSS	-	Mission Support Systems Group Lead
MSO	-	Mission Systems Operations Group Lead
SE	-	Systems Engineer

General considerations include:

- Software altered by unauthorized means, either outside the configuration management system or by a virus, is to be identified as nonconforming and thus handled by nonconforming product requirements and procedures.
- During handling, storage and transmission, software is to be protected from alteration or media degradation. The means may include methods such as secured transmission methods, limited, authorized access and verification with identified, safeguarded masters and back up copies.
- During transportation and storage, products are to be protected from degradation such as from environmental, magnetic field exposure, physical damage or shelf life depletion.
- The requirements of MPD 2810.1 and MPG 2810.1 regarding IT security must be met.
- Upon product delivery, the Project will ensure that documents required to accompany the product are present at delivery and are protected against loss and deterioration.

The Project includes aspects of HSPPD for products in development and products in operations/utilization as discussed in the following subsections.

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7.6.1.1 Products in Development

Products are developed in government or contractor facilities remote from the HOSC and the end users. These products are typically components/units of hardware and software. They also include documentation as well as databases which exist in electronic form. Since these products are valuable government assets, the Project ensures rigorous HSPPD standards for both civil service and contractor facilities. While in the development environment, HSPPD of these products is carried out by MLR designees and procedures as shown in Exhibit 7.6.1.1-1 and as supplemented in the PIP.

ISO Subelement	Software and Related Documentation	Hardware, System Software and Related Documentation	Databases
Handling <ul style="list-style-type: none"> • MLR • Reference 	<ul style="list-style-type: none"> • MSD/MSS 	<ul style="list-style-type: none"> • SE • MPG 6410.1 	<ul style="list-style-type: none"> • MSD/MSS
Storage (during/after development or receipt) <ul style="list-style-type: none"> • MLR • Reference 	<ul style="list-style-type: none"> • MSD/MSS • MPG 6410.1 	<ul style="list-style-type: none"> • SE • MPG 6410.1 	<ul style="list-style-type: none"> • MSD/MSS • MPG 6410.1
Packaging (for shipment to HOSC or Customer) <ul style="list-style-type: none"> • MLR • Reference 	<ul style="list-style-type: none"> • MSD/MSS • MPG 6410.1 	<ul style="list-style-type: none"> • SE • MPG 6410.1 	<ul style="list-style-type: none"> • MSD/MSS
Preservation (during/after development or receipt) <ul style="list-style-type: none"> • MLR • Reference 	<ul style="list-style-type: none"> • MSD/MSS • MSFC-RQMT-2467 • HOSC-PLAN-009 • TREK-015 	<ul style="list-style-type: none"> • SE • MPG 6410.1 • MWI 4520.1 • HOSC-PLAN-009 	<ul style="list-style-type: none"> • MSD/MSS • MSFC-RQMT-2467 • HOSC-PLAN-009
Delivery (to HOSC or Customer site) <ul style="list-style-type: none"> • MLR • Reference 	<ul style="list-style-type: none"> • MSD/MSS • MPG 6410.1 • MPG 2190.1 	<ul style="list-style-type: none"> • SE • MPG 6410.1 	<ul style="list-style-type: none"> • MSD/MSS • MPG 2190.1

Exhibit 7.6.1.1-1. HSPPD Products in Development

HSPPD of products developed for use in the HOSC is generally defined in HOSC-SYS-085, HOSC Configuration Management Procedures Manual.

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7.6.1.2 Products in Operations/Utilization

HOSC Project-generated hardware, software, documentation and database products are received in the HOSC and inspected as discussed in Section 7.8.3. The Project also receives products from customers, which are incorporated into HOSC Project mission configurations. While in the operations/utilization environment, HSPPD of these products is carried out by MLR designees and procedures as shown in Exhibit 7.6.1.2-1 and as supplemented in the PIP.

ISO Subelement	Software, Databases and Related Documentation	Hardware, System Software and Related Documentation	Data Products
Handling <ul style="list-style-type: none"> MLR Reference 	<ul style="list-style-type: none"> MSO HOSC-PROC-180 	<ul style="list-style-type: none"> MSO MPG 6410.1 MWI 4520.1 HOSC-PROC-180 	<ul style="list-style-type: none"> MSO HOSC-PROC-180
Storage <ul style="list-style-type: none"> MLR Reference 	<ul style="list-style-type: none"> MSO HOSC-PROC-180 	<ul style="list-style-type: none"> MSO MPG 6410.1 MWI 4520.1 	<ul style="list-style-type: none"> MSO HOSC-PROC-180
Packaging <ul style="list-style-type: none"> MLR Reference 	<ul style="list-style-type: none"> N/A N/A 	<ul style="list-style-type: none"> N/A N/A 	<ul style="list-style-type: none"> MSO PDSS procedure (?)
Preservation <ul style="list-style-type: none"> MLR Reference 	<ul style="list-style-type: none"> MSO HOSC-PLAN-009 MSFC-PLAN-2929 MSFC-PLAN-2934 MSFC-RQMT-2467 HOSC-PROC-180 	<ul style="list-style-type: none"> MSO MWI 4520.1 HOSC-PLAN-009 MSFC-PLAN-2929 MSFC-PLAN-2934 	<ul style="list-style-type: none"> MSO HOSC-PLAN-009 HOSC-PROC-180 MSFC-RQMT-2467 MSFC-PLAN-2934
Delivery <ul style="list-style-type: none"> MLR Reference 	<ul style="list-style-type: none"> N/A N/A 	<ul style="list-style-type: none"> N/A N/A 	<ul style="list-style-type: none"> MSO MPG 2190.1 HOSC-PROC-180

Exhibit 7.6.1.2-1. HSPPD for Products in Operations/Utilization

7.7 Project Formulation

7.7.1 Quality Planning

This plan provides the fundamental ISO-9000/MMM requirements and objectives and the GSD/HOSC Project approach to satisfying those requirements and objectives. This plan also provides a comprehensive summary of the fundamental procedures to be used to ensure the quality of all GSD/HOSC Project products and services. As such, it defines generally "how" the requirements for quality will be met for each component product, service and customer.

The general quality model for Project-developed products is shown in Figure 7.7-1. This diagram indicates the need to define process quality contributors including defined processes and process measures (records) during the planning phase of each activity/product.

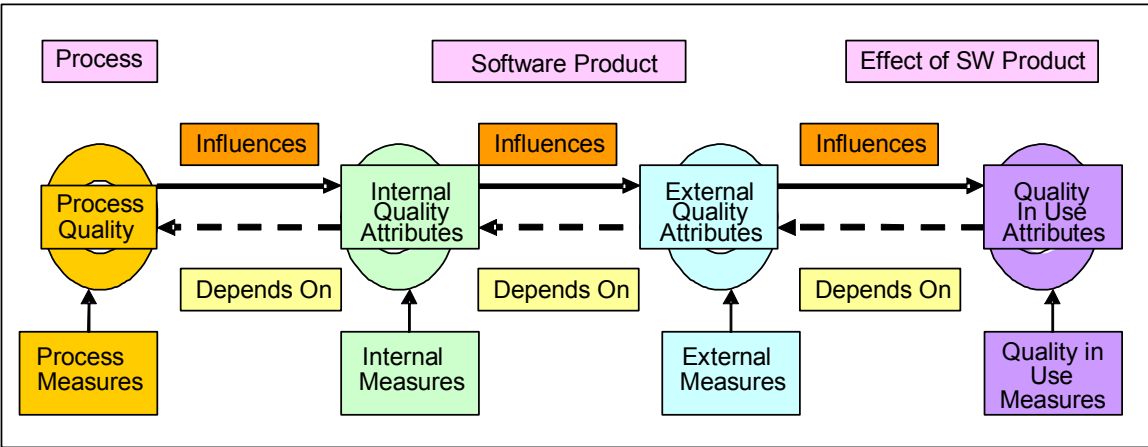


Exhibit 7.7.1-1. Quality Model

The relationships between internal, external, and user quality requirements are illustrated in Exhibit 7.7.1-2.

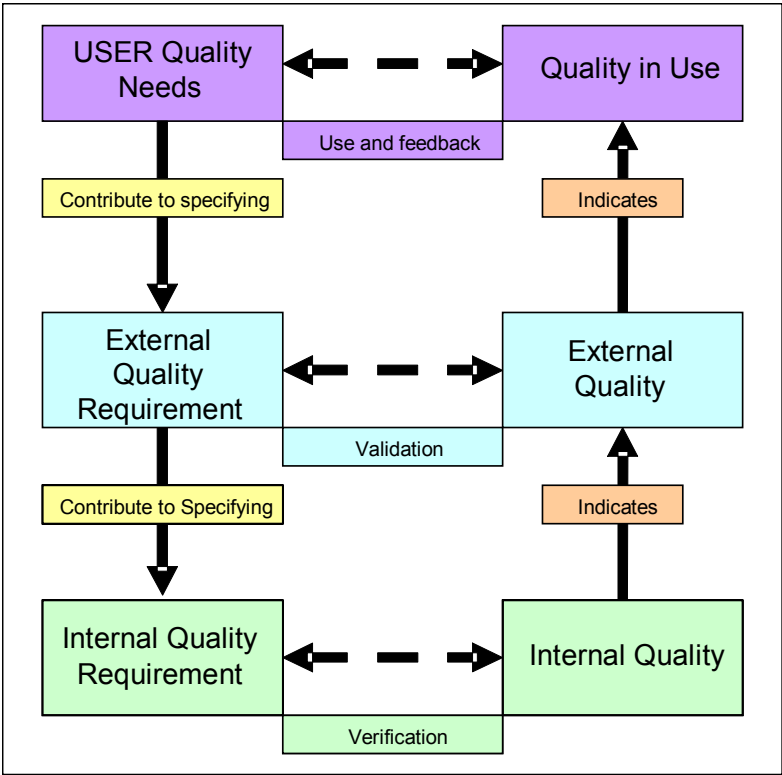


Exhibit 7.7.1-2. Quality Planning Relationships

These quality requirements/relationships are considered in all HOSC Project quality planning.

The Project is on-going and has multiple customers. Over time, it acquires new customers with requirements that are different than the then-current capabilities the HOSC can accommodate. In addition, current customers require capability changes. As a result, new products/capabilities are

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developed on a recurring basis. (As an example, development of a monitoring system for a new space launch vehicle for flight testing would be considered a new product/capability.)

All new product/capability development is to follow the guidance and procedures defined in this Quality Plan. The implementation of the new products/capabilities is planned using a Product Implementation Plan (PIP). Each PIP defines the flowdown of quality requirements and objectives as are defined in this Quality Plan for each ISO requirement involved with the new product and/or service. This flowdown ensures that both the Project and the MSFC quality policies, systems, objectives, etc. are inherent and reflected in every HOSC product, service, and delivery. This flowdown includes the requirements for records, as are indicated throughout this plan. Exhibit 7.7.1-3 illustrates this overall flowdown.

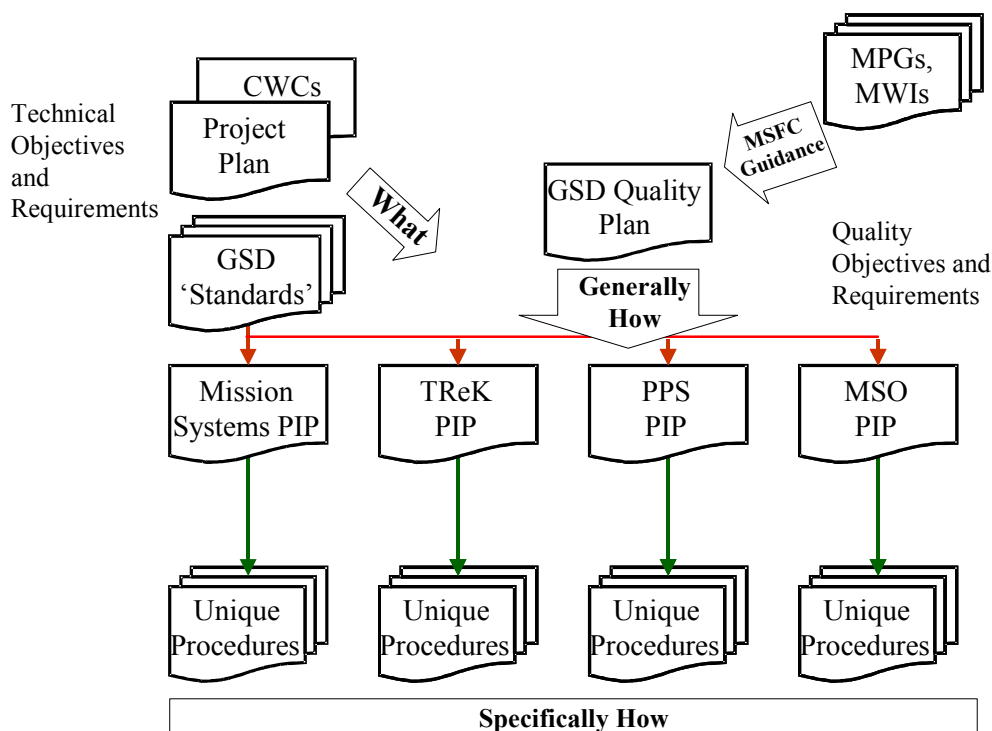


Exhibit 7.7.1-3. Planning Overview

The current PIPs are included in Appendix B. Any deviation from utilization of the HOSC standard procedures cited in this Quality Plan must be called out in the PIP. The PIP is subject to the approval of the Group Lead and the Project Manager.

The following considerations/activities are integral in the quality planning/flowdown process described above:

- The PIP defines how the technical objectives and requirements will be accomplished and how the quality objectives and requirements will be accomplished (i.e., the PIP is a mini-quality plan).
- The PIP provides for definition of the required verification, validation, monitoring, inspection and test activities specific to the product and the criteria for product acceptance.
- The PIP defines the records needed to provide evidence that the product or service delivery processes and the resulting products/services meet the requirements.
- The PIP defines the configuration and data management procedures to be applied.

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- Some new projects/requirements may necessitate the HOSC Project to create new quality procedures and/or to modify existing procedures/processes. In addition, they may necessitate acquisition of new/modified controls, equipment, and skills. In these cases, the general approach is to define and implement the requirements for quality assurance for the new project/customer in the PIP, flow any necessary changes up into this Quality Plan, and then make the necessary changes to the Project documentation referenced in this plan.
- Any contemplated changes to the quality system are analyzed in advance by the systems engineer and MR to ensure on-going compatibility of the design, production inspection/test, installation, and servicing processes.
- The quality system is continuously improved through changes, as described above, and through corrective and preventive actions, as discussed in Section 7.1.6.
- Changes and improvements include identification and implementation of records of ever increasing effectivity and efficiency.

7.8 Project Management/Systems Engineering

The Project follows the guidance of MPD 1280.1, Section 7.8 for matters regarding Program/Project Management and Systems Engineering.

7.8.1 Design and Development

The sections which follow apply to Project and contractor/supplier designed and developed products.

7.8.1.1 General

The Project utilizes documented procedures to ensure that the design of software, hardware, facilities and documentation products satisfy the requirements specified in the Customer Agreement and associated detailed supplements. These procedures leverage MPG 8060.1, Flight Systems Design/Development Control, MPG 8060.2, Non-Flight and Non-Facility Design and Development and MPG 8040.1, Configuration Management, MSFC Programs/Projects. The overall life cycle process is defined in MSFC-PLAN-2929, HOSC CM Plan.

High-level functional/user requirements for products and services are defined using the customer agreement review process discussed in Section 7.1.3. These requirements are agreed-to by the customer and the Project Manager and are documented in collaborative work commitments (CWC). The approved CWC constitutes the authorization to proceed (ATP). Detailed requirements are defined, identified, and documented using procedures compliant with those defined in the CM Plan, or as specified in the PIP. Detailed requirements are acquired from customer-defined/provided specifications and standards. They are compiled by the systems engineer in documents such as MSFC-RQMT-1440, Generic Requirements for the Enhanced HOSC System.

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7.8.1.2 Design and Development Planning

The Project Manager assigns responsibility for the design activity to a GSD Group Lead, as depicted in Exhibit 7.1.1.4-1. The Group Lead assigns a Team Lead to prepare a PIP for each major design and development activity. The Group Lead ensures overall, on-going integration. The PIP describes or references the specific design/development methodologies to be applied and defines responsibility for their implementation. The PIP provides for definition of the design and development life cycle to include methodology/stages, reviews, configuration baselines, configuration control, verification, and validation. The PIP is subject to the approval by the Group Lead and the Project Manager. The design and development activities are assigned to qualified personnel equipped with sufficient resources. The Team Lead updates the PIP as the product evolves.

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The product implementation schedule defines the task sequence, mandatory steps, and significant stages and milestones.

Reliability, maintainability, portability, usability, functionality and efficiency are considered during the planning for the design and development process utilized for each product/build. The Project's documented and implemented plans ensure that the requirements of the Customers and other Stakeholders agreement and any additional specified requirements are met.

The Product planning will include (as applicable):

- Product definition, including objectives.
- Definition of requirements for the product/service.
- Organization of resources, including responsibilities and use of contractors.
- Identification of resources to support operation and maintenance of the product.
- Organizational and technical interfaces.
- Linkage to a life cycle model, such as inputs and outputs for each activity, development and management activities to be carried out, and technical/milestone reviews as required in MSFC-PLAN-2929 CM Plan.
- Identification of practices and tools.
 - Specific design and development activities to be carried out.
 - Required inputs for each activity.
 - Required outputs from each activity.
 - Management and supporting activities to be carried out.
 - Required team training.
 - Organizational interfaces with regard to design and development.
 - Analysis and assessment of dependencies, problems and risk during design and development.
 - The schedule identifying activity stages, reviews, baselines, related activities, resource requirements, associated dependencies, milestones and test activity scheduling.
 - Criteria for meeting CM requirements during the design and development phases.
 - Verification and validation success criteria.
 - Use of IT security and contingency plans.
- Identification of the release authority for products.

All requirements and configuration baselines will be maintained under configuration control in accordance with the CM Plan.

7.8.1.3 Organizational and Technical Interfaces

Organizational interfaces between the HOSC Project and the various customer organizations are defined in HOSC-PLAN-623, HOSC Project Plan, Section 4. High level requirements (CWCs) and changes to them are coordinated between the customer and the Project Manager. Definition and clarification of detailed requirements are coordinated between the customer's technical representatives and the Team Lead in accordance with HOSC CM Plan procedures. GSD internal interfaces are as shown in Exhibit 7.1.1.4-1 – GSD/HOSC Project Organization. The Team Lead allocates design activities among civil service personnel and contractors – subject to the approval of the Group Lead and Project Manager.

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These allocations/assignments are documented in the PIP. Interfaces with contractors are defined in the contract. Design work progress (internal and contracted) is regularly reported and reviewed as defined in HOSC-PLAN-623.

Technical (hardware/software) interfaces are defined in Interface Control Documents (ICD), as defined by the procedures of MSFC-PLAN-2929 or the PIP.

7.8.1.4 Design and Development Inputs

Design and development inputs are based on customer *functional and performance* requirements, applicable statutory and regulatory requirements, information derived from previous similar designs and other essential requirements as enacted by Customer Agreement/CWC and the detailed supplements. Inputs also include any applicable information from the ALERTs database. The PIP-designated systems engineer coordinates with customer representatives to ensure functional requirement clarity and completeness and to eliminate ambiguity. Customer requirements are documented in MSFC-PLAN-904, HOSC Functional Requirements and Implementation Plan, and MSFC-RQMT-1440, Generic Requirements for the Enhanced HOSC System by the process described in the HOSC CM Plan. The systems engineer derives *system* requirements from the functional requirements. The system requirements define the information technology capabilities needed to satisfy the functional requirements. System requirements are documented in Level IV specifications as described in the CM Plan. The Team Lead reviews the functional and derived system requirements and allocates them to appropriate personnel for further definition, documentation, and implementation.

Risks involved with product delivery (e.g., short time allowed) are evaluated and documented.

Changes to requirements are handled in accordance with the CM Plan change process and are provided to the design personnel in a timely manner. Requirements and changes are provided to development and verification/validation personnel using the CM and DM processes.

7.8.1.5 Design and Development Outputs

The design personnel provide design and development outputs that are documented and expressed in terms that can be verified and validated against design input requirements.

The design output will include:

- Evidence of completed design with full traceability to input requirements.
- Documentation, including specifications and that necessary for operation, training and maintenance.
- Test specifications versus the input functional and performance requirements.
- Key characteristics of the product.

Design output must:

- a) Meet the design input requirements (for each functional, performance, and system requirement),
- b) Contain or make reference to acceptance criteria (normally in the test plan), and
- c) Identify those characteristics of the design that are crucial to the safe and proper functioning of the product (e.g., operating, storage, handling, and maintenance requirements). Any such characteristics are addressed in the production process (Section 7.1.5.1).
- d) Specify all pertinent data required to allow the product to be identified, produced with specified materials, inspected, used and maintained to achieve product conformity.

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- e) Include drawings (as appropriate), component lists, specifications, and a listing of those drawings, parts lists, and specifications necessary to define the configuration and the design features of the product.

When using prototyping development, documentation may follow use within the development environment. Prototype product will not be used to perform actual operations within the HOSC. The product acceptance criteria will be defined in order to demonstrate that the product requirements are correctly reflected in the design output.

Design output is documented and expressed in terms that can be verified and validated against design input requirements as defined in the Test Plan. Records generated from these processes are managed as defined in Section 7.1.7.

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Design outputs are generally as defined for technical reviews in MSFC-HDBK-3173, Project Management and System Engineering Handbook. Design outputs are maintained/protected/controlled as defined in MPG 1440.2, MSFC Records Management. Outputs are reviewed and approved by the Team Lead prior to release.

7.8.1.6 Design and Development Review

The Team Lead plans, schedules, conducts (as appropriate), and participates in reviews of the design and development results for both internal and contracted products, as defined in MSFC-PLAN-2929 or the PIP. These reviews may include verifications/validations of incremental releases or end products. The reviews focus on evaluating whether or not the results of the design and development meet the requirements. Reviews are used to identify any discrepancies/problems and to propose and initiate necessary actions. Participants at each design review include representatives of all functions involved with the design stage being reviewed, as well as customers and other specialist personnel, as required.

Reviews:

- Identify what specifically is under review, and who specifically is responsible to assure a successful and complete review.
- Identify records requirements.
- Identify methods for monitoring the applications of rules, standards and project process requirements.
- Identify review preparation activities and responsibility to prepare.
- Identify the success criteria for the review.
- Identify any discrepancies/problems as early as possible and enable solutions prior to the scheduled/required release of the product for use.
- Identify any inclusion of hardware, software, database, or procedure currently being tracked in the ALERTs system.
- Identify review follow up activities which will address discrepancies found during the review.

Following the identification of any problems/discrepancies, the Team Lead will authorize further design and development activities to proceed only when the consequences of all known deficiencies are understood, documented and resolved or the risk of proceeding has been recorded in the risk management system.

Records of reviews (e.g., review item discrepancies) and any necessary actions are maintained as described in Section 7.1.7, the CM plan and/or the PIP.

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7.8.1.7 Design and Development Verification

The Team Lead plans, schedules, initiates, and participates in design verification as defined in MSFC-PLAN-2929 or the PIP to determine whether or not the design stage output meets the documented design stage input requirements - for each requirement. (Verification activities are also discussed in Section 7.8.3.) Verification is normally conducted by personnel who are independent from the developers, as defined in the PIP. Verification may include reviewing the design documentation versus the requirements, comparing the new design with a similar proven design, undertaking tests and/or demonstrations, and performing alternative calculations. Verification test activities will at least simulate and where possible emulate the production environment and wherever possible, utilize data for which results have been independently verified. Verification may be conducted concurrently with validation when the corresponding procedures are approved in the PIP. The product is considered to have successfully passed verification only when the reports, calculations, test results, etc. have demonstrated that the product meets the specification requirements for all identified operational conditions. The Group Lead is the approval authority for product release. Verification results/records (reports, calculations, test results, etc.) are processed/controlled as discussed in Section 7.1.7.

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7.8.1.8 Design and Development Validation

Design validation is performed by the product users, after the products are verified, delivered, installed and tested, as discussed in Section 7.8.1.7 and 7.8.3.4. Validation is performed in the operational environment using simulated and/or actual data/input to validate that the design and delivered product meets the users' functional requirements. Validation exercises all of the product's intended uses. Validation results (nonconformities) and any necessary actions are documented using the HOSC Problem Report system, as defined in FPD-OI-FD40.10, HOSC Problem Report. Nonconforming products are controlled as discussed in Section 7.8.6.

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7.8.1.9 Design and Development Verification and Validation Testing

Tests for verification and validation will be planned and conducted to determine whether or not the product meets the input requirements. Verification/validation testing is normally conducted by personnel who are independent from the product developers, as defined in the PIP. Testing includes these elements:

- Test plans/specifications identify the product to be tested, resources utilized, test objectives and conditions, parameters to be recorded, and success/acceptance criteria.
- Test procedures describe the method of operation, the performance of the test, and the recording of the results.
- Monitoring and measurement devices are identified (e.g., test software). Reference Section 7.8.4.
- The correct configuration of the product is submitted for test.
- The requirements of the test plan and the test procedures are observed.
- The success/acceptance criteria are met.

Products are released for usage by the Group Lead only after successful verification/validation.

At the completion of design and development specific records will be generated as described in the PIP and/or test procedure. Records may include reports, comparison with results from independent tools and models, comparison with validated previous version results, calculations, and test results and will be adequate to evidence whether or not the product meets the specified requirements and success/acceptance criteria for all identified operational conditions. Records and any necessary actions are controlled as described in Section 7.1.7.

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7.8.1.10 Control of Design and Development Changes

The Team Lead ensures that all design changes and modifications are identified, documented, reviewed, verified and validated, as appropriate, and approved by the appropriate authority/control board before their implementation. This includes changes resulting from customer functional requirements evolution and changes resulting from system requirements evolution. The review of changes includes evaluation of the effect of the change on the product already delivered. The procedures for processing changes are as described in MSFC-PLAN-2929 or the PIP. The change control process provides for customer (and/or regulatory authority, as appropriate) approval of changes.

In general, minor changes are those which are considered by the governing GSD control board to be within the CWC-defined baseline. Complete design documentation is required for minor changes. Major changes are those which are considered by the governing GSD control board to be outside the CWC-defined baseline. Formal adherence to design control (i.e., the procedures of Section 7.8.1) is required for major changes.

The Team Lead ensures that baseline design changes are documented and retained as records, as described in the CM Plan or the PIP.

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7.8.2 Product Identification and Traceability

Product identification and traceability is provided throughout the life cycles of all Project systems and facilities in compliance with MPG 8040.2, Product Identification and MWI 8040.4, Application Guidance for Traceability. These are implemented as defined in MSFC-PLAN-2929 or the PIP.

In summary:

- The systems engineer or operations lead identifies and documents customer functional and performance requirements. Customer requirements are numbered using the CM Plan-defined procedure.
- The systems engineer or operations lead derives system requirements from the functional and performance requirements. System requirements and their decomposition elements are documented and numbered using the PIP-defined procedure.
- The systems engineer or operations lead allocates system requirements to component, subsystem or system elements, as appropriate. System elements are each identified. The elements are grouped to form builds/releases, which are named and version numbered using the PIP-defined procedure. Build/release identification includes a record of all component element identifications.
- Evolving configurations are identified in documents such as prescribed in MSFC-HDBK-3173 for technical reviews.
- Build/release status is tracked through the design, production, installation, testing and servicing processes using the element name/version procedure. This includes identification of product status with respect to monitoring and measurement requirements.
- The identifications of products provided to users (e.g., KSC) are recorded.
- The failure of a build/release to satisfy an allocated requirement is considered a nonconformity. Nonconformities against elements are tracked using the PIP-defined procedures specified for the particular life cycle stage (e.g., design, production, etc.). Differences between actual configuration/capability and agreed to configuration/capability are tracked via the HOSC Problem Report process.

Records are maintained at each step of this on-going life cycle process as discussed in MSFC-PLAN-2929 or the PIP.

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7.8.3 Monitoring and Measurement of Product and Process

Monitoring and Measurement during product development includes:

- Design and Development Reviews.
- Verification and validation as discussed in Sections 7.8.1.7 and 7.8.1.8.
- Unit Test.
- Integration Testing.
- In-Process Audits versus documented requirements.
- Validation Testing.
- Configuration Audits including Physical Configuration Audits.
- Security assessment.

Documentation of the results of these activities constitutes records.

The GSD provides several distinct roles regarding inspection and testing - depending on the specific product/system. These include:

- Developer, integrator, tester, and inspector for TReK, which is an in-house activity.
- Integrator, tester, and inspector for PPS, wherein components and subsystems are developed by contractors and other NASA organizations - and integrated/tested by the GSD.
- Inspector for EHS wherein the systems are developed, integrated, tested and verified by contractors.

TReK and PPS also utilize contractors for test Independent Verification and Validation (IV&V) support. In all cases acceptance is the responsibility of the GSD Group or Team Lead.

Product conformity to requirements is demonstrated during both verification and validation testing, and ongoing operations through strict CM process requirements and HOSC Project monitoring.

7.8.3.1 Plans and Procedures

Documents such as HOSC-SYS-121, HOSC Validation and Certification Plan (HVCP), provide guidance for the overall inspection and test procedures for the products. These documents, which are defined in the PIP, describe the procedures for verifying that the specified requirements for the products are met. They also specify testing responsibilities, the release authorities, the test inputs, success/acceptance criteria, process and outputs, and the required test records. The test records provide evidence of conformity with the success/acceptance criteria.

7.8.3.2 In-Process Inspection and Testing

In-process inspection is initiated in the design phase, as discussed in Section 7.8.1. This is to ensure that all specified requirements for the product are included in and satisfied by the design output prior to product release for usage. This is accomplished through the procedures described in Sections 7.8.1.6 and through 7.8.1.9.

In-process inspection and testing is carried out during the production and installation phases, as described in the product-specific test plan (defined in the PIP).

7.8.3.3 Receiving Inspection and Testing

Products are produced in off-line development environments located in government and contractor facilities. "Receiving" occurs when these products are (1) released to users or (2) installed/integrated in

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the HOSC operations facility. Installed products/builds (within the HOSC) are verified following procedures of the test plan. Product acceptance is by Project personnel. Installed products/builds (remote from the HOSC) are verified/validated by users. All test failures and their resolutions are documented/tracked by the HOSC Problem Report System. **R**

Product/builds may be received with known defects or deficiencies, which limit the capability to support all of the intended operational requirements. These defects/deficiencies are known to exist as a result of testing and/or as a result of schedule pressures requiring product release prior to final completion of all capability component requirements. In these cases, the defects/deficiencies are documented by the developer/integrator and IV&V Teams in the build release packages for resolution in subsequent builds/releases. A report is provided to detail every known problem and the criticality of the fault. Defective/deficient releases are subject to the approval of the Project management. Waivers/concessions may be issued following guidance of MSFC-PLAN-2929, CM Plan or the PIP. **R**

7.8.3.4 Final Inspection and Testing

Subsequent to IV&V, products/builds are turned over to the users and the IST for operational/customer support. The IST and users/customers perform final inspection and testing of products (i.e., validation) through utilizing them in support of space flight/payload ground simulations and tests – in conjunction with other space program facilities. Any problems/failures of the products to meet the user requirements are documented using the FPD-OI-FD40.10, HOSC Problem Report (HPR) system. (In cases where users/customers determine that any product needs more/different capabilities than originally required, an Engineering Change Request (ECR) or PIP-specified request is processed to initiate product upgrade.) **R**

Product utilization for space flight/mission support is subject to control and reporting procedures as defined FPD-OI-FD40.4, Flight Certification for Ground Systems. These procedures require:

- GSD Element Flight Certification Statement and background information
- GSD Flight Certification Statement and background information.

7.8.3.5 Inspection and Test Records

Testing processes are characterized by an input (test plan), which includes success/acceptance criteria, a test process, and an output (test report/record) which includes performance against the success/acceptance criteria. Design and production/implementation records are maintained in development folders by the developer. These include the results of inspections/tests conducted by the developer. Similar records are developed/maintained for integration activities. Test and inspection plans and results relative to the activities of the IV&V teams are maintained by these teams as specified in the item test plans. These identify the inspection authority responsible for the release of the product as well as the pass/fail status for all tests.

Inspection and test records, as identified in Section 7.8.3.2 through 7.8.3.4, are maintained as described in the PIP and Section 7.1.7. **R**

7.8.3.6 Monitoring and Measurement of Process

The Project applies various suitable methods for monitoring and, where applicable, measuring the effectiveness of the safety and quality management system processes.

- Overall management system/process effectivity is monitored and measured by the technical, schedule, and budget management and control processes cited in the HOSC Project Plan.
- Safety-related performance is measured through the processes of the MPG 8715.1, Marshall Safety, Health, and Environmental Program.

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Quality system-related process effectivity is monitored and measured through analysis of inputs such as:

- “Help desk” contacts relating to both product and process performance.
- Issues including classification, frequency and root cause.
- Reliability, Supportability and Maintainability Metrics versus established requirements.
- User feedback, both for evidence of environment performance as well as conformance to established plans and procedures. User feedback is facilitated through the HOSC User Survey and “How Are We Doing” Survey processes.
- Feedback from suppliers (NASA and contractor organizations).

Any adverse instances or trends are addressed through the corrective or preventive action procedures discussed in Section 7.1.6.

Quality system audits are utilized to identify and assess the effectivity of the documented plans, procedures, and work instructions – as discussed in Section 7.1.8. Configuration audits provide evidence of the effectiveness of CM processes executed per the CM Plan.

Any HOSC user may report a non-compliance issue through the user survey and/or problem reporting systems. For non-compliances judged by the user to risk safety or mission success, the issue will also be reported to the HOSC Project Manager immediately.

In the event of process nonconformity, the Project evaluates whether the process nonconformity has or could result in product nonconformity. If product nonconformity has occurred, it is handled as discussed in Section 7.8.6.

7.8.4 Control of Monitoring and Measuring Devices

Monitoring and measuring devices include, but are not limited to, test hardware, test software, and any other equipment used to provide evidence of product conformity to the requirements. The offices of primary responsibility for such devices maintain a record of the devices and define the process used to ensure their calibration – including device identification, location, frequency of checks, check method, and acceptance criteria. The process also defines how such devices are protected from damage, deterioration, or adjustment that would invalidate the measurement result.

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HOSC Project use and control of monitoring and measuring devices is defined in Exhibit 7.8.4-1.

Monitoring and Measuring Devices	Control Procedure
<ul style="list-style-type: none"> • Tools used by Project technical personnel (contractors) to maintain computers, peripherals, timing, and communications hardware. (Examples are oscilloscopes, electrical meters, etc.) 	<ul style="list-style-type: none"> • Maintenance tools are calibrated in compliance with MPG 8730.5, Control of Inspection, Measuring and Test Equipment. The calibration program is the responsibility of the Mission Systems Operations Group Lead.
<ul style="list-style-type: none"> • Test software/platforms used by V&V/test teams for validating that hardware and software configuration items correctly process data. (Examples are telemetry stream generators and configuration item or subitem simulators.) 	<ul style="list-style-type: none"> • Test software/platforms are designed, identified, developed, and tested using the procedures discussed in Sections 7.1.5, 7.8.1, 7.8.2, and 7.8.3, respectively. Control is by the Mission System Development Group Lead using the procedures defined in MSFC-PLAN-2929 or the PIP.

Exhibit 7.8.4-1. Monitoring and Measuring Device Control Procedures

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Test tools are calibrated at manufacturers' recommended intervals; these intervals are displayed on the device, as practical. Applicable records are maintained as described in Section 7.1.7. Test software is rigorously tested by manual comparisons. Maintenance tools records are kept by the MSFC Calibration Facility, and test software records are maintained by the Mission Systems Development Group. Device users ensure that environmental conditions are suitable for the calibrations, inspections, measurements and tests being carried out.

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7.8.5 Inspection and Test Status

Inspection and testing are tracked such that the status of each product's capability to satisfy each individual customer requirement is known at all times. The specific I&T status posting mechanism is shown in the PIP. In general, developer I&T status is tracked using release notes/reports, and integrator/IV&V/operations phase I&T status is tracked using problem reporting systems. (Reference Sections 7.8.2 and 7.8.3.) Evidence of conformity with the acceptance criteria will be maintained. Records indicate the person(s) authorizing release of product and are maintained as defined in Section 7.1.7.

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7.8.6 Control of Nonconforming Product

Nonconforming products are defined by builds/releases which are found/known to contain defects (nonconformities) which render the build/release incapable of completely satisfying a specific customer requirement. When such defect/nonconformity is identified during testing/verification, the product may be released for customer utilization subject to receiving a waiver/concession via the PIP-defined process. The Group Lead is the release authority. Any delegation of this authority is documented in the PIP-defined procedure. Any release of nonconforming product is in coordination with the customer and users. When such defect/nonconformity is identified during customer/user validation or utilization, the product normally remains in usage pending solution of the defect/nonconformity via the HOSC Problem Report procedure.

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Any nonconformity that could affect safety, mission success, or reliability is reported to the Project Manager immediately. The Project Manager dispositions any safety-related issue with the customer(s).

Upon discovery of a nonconformity through the problem reporting system, the Team Lead notifies all organizations who may be affected by the nonconformity. This includes customers, users, and suppliers. The notification includes a clear description of the nonconformity, which includes as necessary, products affected, configuration/release identification numbers, and dates delivered. The ALERTs process of MWI 1280.5 is used as directed by the Project Manager.

Records are maintained on the mean time between failure (MTBF) of key hardware platforms and are reviewed quarterly for conformance. If a nonconformance is found, the vendor is contacted to correct the problem.

Nonconformity records (problem reports) are processed as described in FPD-OI-FD40.10 and Section 7.1.7.

Products that are reworked to eliminate nonconformances are subject to the verification/test procedures of Section 7.8.1.

7.8.7 Statistical Techniques

The PIP-identified systems engineers or operations personnel track numbers and trends in hardware failures and utilization of facility metrics. The MSOG Lead tracks results of records such as user surveys and incident reports. These tracking activities provide inputs for the Continuous Improvement Process discussed in Section 7.1.6. Records are maintained as defined in Section 7.1.7.

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7.8.8 Safety

This section defines the approaches for meeting the MSFC system safety and industrial safety requirements.

7.8.8.1 System Safety

The Project utilizes system safety as applicable to assure all hazards impacting personnel, hardware, or mission success are identified and eliminated, controlled or accepted based on risk analysis (reference Section 7.1.6.2 and HOSC-PLAN-635). The Project uses the various available tools based on system complexity and loss potential and tailors the system safety analyses as appropriate.

7.8.8.1.1 System Safety Tools

System Safety is assured through a series of iterative hazard analyses applied to support the design maturity. This includes ALERTs processing as defined in MWI 1280.5. The analyses are applied in the life cycle reviews and any identified hazards are processed as risks. Exhibit 7.8.8.1.1-1 defines the tools/reviews used in the life cycle process.

System Safety Tool	Life Cycle Milestone
Preliminary Hazard Analysis (PHA)	HOSC SRR and PDR
Subsystem Hazard Analysis (SSHA)	HOSC CDR
Software Hazard Analysis (SWHA)	Program FRR
System Hazard Analysis (SHA)	Program FRR
Operating & Support Hazard Analysis (O&SHA)	Program FRR
Integrated Hazard Analysis (IHA)	Program FRR

Exhibit 7.8.8.1.1-1. System Safety Tools

The Programs integrate the HOSC Project's hazard analyses into their own to establish the IHA, as discussed in Sections 7.8.8.1.2 and 7.8.8.1.3. The Project includes Data Requirements in contracts as applicable to meet this requirement.

7.8.8.1.2 Safety Review Board Support

The Project supports the MSFC Payload Safety Readiness Review Board (PSRRB) as required in MWI 1700.1, Payload Safety Readiness Review Board. The Project procedure is defined in FPD-OI-FD40.4, Flight Certification for Ground Systems.

7.8.8.1.3 Certificate Of Flight Readiness (CoFR)

The Project provides a CoFR for each flight, as required by the PSRRB, using the procedure of FPD-OI-FD40.4.

7.8.8.1.4 Range Safety

Per NPG 8715.3, NASA Safety Manual, range safety requirements are complied with by the Program. The HOSC Project is not involved in range safety.

7.8.8.1.5 Space Debris Safety

NPD 8621.1, NASA Policy for Limiting Orbital Debris Generation requirements are complied with by the Program. The HOSC Project is not involved in space debris.

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7.8.8.1.6 Contingency Planning

A Contingency Plan is established by the Program and approved by the Program Manager prior to each flight. The establishment of the Contingency Plan is a Flight Readiness Review (FRR) element. The HOSC Project supports contingency planning through the procedures of HOSC-PLAN-009, HOSC Contingency Plan and MSFC-PLAN-2934, HOSC Emergency Disaster and Recovery Plan.

7.8.8.1.7 Nuclear Safety For Launching of Radioactive Materials

The HOSC Project is not involved in activities wherein the nuclear safety provisions of NPG 8715.3, NASA Safety Manual would apply.

7.8.8.2 Industrial Safety

The Project meets the NASA and MSFC industrial safety requirements in the conduct of all operations through following the guidance of MPG 8715.1, Marshall Safety, Health, and Environmental (SHE) Program. The Project will support the Voluntary Protection Program when implemented at MSFC.

7.8.8.2.1 Safety Meetings

The Project Manager conducts and documents monthly industrial safety meetings with all Project personnel under his/her management. The meetings address personal and job-related safety. The safety topics relate to the seasonal safety hazards and personal experiences as much as possible. The Center industrial safety office provides instructional and motivational material for these meetings.

7.8.8.2.2 Project Safety Area Surveys

The Project Manager conducts monthly safety walk-arounds with randomly selected Project personnel. The walk-arounds are conducted to assure compliance to safety rules and to solicit corrective measures from personnel to assure a continuing safe working environment. The findings are documented and a disposition established (i.e., a work order or acquisition initiated and/or on-the-spot correction of the nonconformance) as appropriate by the Project Manager. Each safety noncompliance is verified as 'closed' by the Project Manager.

7.8.8.2.3 Contractor Industrial Safety Requirements

Contractor compliance with industrial safety requirements is reviewed and assessed as defined by the contract. Each contractor is required to establish an Industrial Safety Plan and submit industrial safety metrics.